AEC–FCDA RELATIONSHIP

HEARING

BEFORE THE

SUBCOMMITTEE ON SECURITY

OF THE

JOINT COMMITTEE ON ATOMIC ENERGY

CONGRESS OF THE UNITED STATES

EIGHTY-FOURTH CONGRESS

FIRST SESSION

ON

AEC–FCDA RELATIONSHIP

MARCH 24, 1955

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AEC-FCDA RELATIONSHIP

THURSDAY, MARCH 24, 1955

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON SECURITY OF THE
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D. C.

The subcommittee met, pursuant to notice, at 3 p. m. in room 1334, New House Office Building, Hon. Paul Kilday presiding.

Present: Representatives Kilday, Durham, Holifield, Price, Cole, Hinshaw, and Van Zandt.

Representative KILDAY. The committee will come to order.

We expect other members in just a moment but we will get started.

We have with us today Admiral Strauss of the Atomic Energy Commission and Governor Peterson of the Federal Civil Defense Agency. We feel they will greatly assist this subcommittee in its study of the security mechanism of the Atomic Energy Commission as it relates to national civil defense planning.

The Joint Committee on Atomic Energy has a statutory duty under the Atomic Energy Act to conduct continuous studies of the activities of the Atomic Energy Commission. In its legislative function the committee also continuously examines the Atomic Energy Act to assure itself that standards of that basic statute are serving the national interest. A portion of these functions has been delegated to this subcommittee—examination of the security regulations of the AEC and the pertinent sections of the act from which they arise.

Recently the press of the Nation reported testimony before other committees of Congress on planning for the civil defense of the United States. Some of these articles suggested that civil defense planning may have been delayed or impeded because of the inability of the Federal civil defense agency to have sufficient personnel receive AEC Q clearances and to obtain classified information on the effects of atomic and thermonuclear weapons.

Today this subcommittee would like to explore the AEC–FCDA security relationship and assure itself that the security mechanism of the Atomic Energy Commission, and the law from which it grows, is sufficiently flexible to guarantee that the civil defense planning agency has access to necessary data upon which to base its plans for the defense of our population.

Of course, certain phases of the security program are under investigation, hearings are being held in other committees. There is no conflict between what we propose to do here today and the activities of any other committee.

The Joint Committee on Atomic Energy happens to be the only committee with authority to report legislation having to do with

atomic energy and in view of some of the testimony and impressions and information carried by the press, that there might be some too stringent restrictions on information from the AEC to the civil defense agency, we felt we should examine into it to determine whether there was anything in the way of legislation necessary and if there is it should not be unnecessarily delayed.

We have with us Admiral Strauss and Governor Peterson and if they will both come to the table, we will proceed.

I would like to have Governor Peterson first, and then Admiral Strauss, give us their statements and then after both have testified the committee will have questions, I am sure, to propound to either or both of them.

Governor, if you will proceed we will appreciate it.

Representative COLE. Before you start with the witnesses, Mr. Chairman, I wonder if it might not be appropriate to observe that I see in this room not a single representative of the public. Every person I see sitting here is somebody identified with the Commission or representing the press, and I am curious to know how widely it has been advertised that this public meeting was to be held to discuss a subject which should be of such great concern to the public generally.

Can you tell me when notice of this meeting was released to the public? I know in my own case a card notifying me of this meeting lay on my desk at least 2 days.

Representative KILDAY. There was one difficulty, a press release of the fact that the subcommittee would hold hearings and I believe the date was given as the 21st. It happened that the House Members became involved in a resolution having to do with disposal of rubber plants which required 2 days of debate on the floor and this hearing was necessarily postponed.

I understand there was some error in the morning paper as to the time and nature of the hearing and as to whether it was executive or open. At least I am hopeful that the press will get the information to the public.

Representative COLE. Mr. Chairman, in order that my observation may not be inaccurate, I should like to give an opportunity to anybody who is not connected with the Atomic Energy Commission or the Civil Defense Administration or the press to indicate that by raising their hand, or Members of Congress or the congressional committee.

Let the record show that I see no hand raised.

Yes; there is one. The lady who came in after I made my initial observation. There is one person not representing an agency of the Government.

Representative KILDAY. You are most welcome.

Governor, you may proceed with your statement, please.

STATEMENT OF VAL PETERSON, ADMINISTRATOR, FEDERAL CIVIL DEFENSE ADMINISTRATION

Mr. PETERSON. Before I start reading my formal statement, Mr. Chairman, I should just observe that I have made available to the committee the portion of the testimony that I gave before the Civil Defense Subcommittee of the Senate Committee on Armed Services on March 4. I don't know that it is necessary to read it again, but I call attention to that fact.

Representative KILDAY. Do you desire to have it made part of the record of this hearing?

Mr. PETERSON. Yes, please.

Representative KILDAY. Without objection it will be included in the record.

(The material referred to follows:)

EXCERPTS FROM TESTIMONY BY VAL PETERSON BEFORE CIVIL DEFENSE SUBCOMMITTEE OF THE SENATE COMMITTEE ON ARMED SERVICE, MARCH 4, 1955

I might say, Mr. Chairman, that without any implied criticism on my part or any discussion of the merits of the security or of the classification which was placed on fallout data, without passing any judgment on it here in this comment, I might say that that classification made it extremely difficult for us to work in the area of preparation, to take effective steps to meet the threat of fallout.

For instance, we simply could not reveal that data to the Bureau of Public Roads. It is classified; you cannot discuss it.

Senator KEFAUVER. I can see that would be a very big deterrent to proceeding.

Mr. PETERSON. Yes, and even in my own organization, in our own organization, I think I should say, in justice to the people who are on my staff, that we could not discuss the fallout problem or fallout data with even the people in our agency who were cleared to accept secret because they did not have Q clearance; obviously they were not, under the law, entitled to this information, so we had a very difficult situation in which one man in a shop working side by side with another man could have this information while the other fellow could not, and it made a trying situation when we lost a number of stenographers and clerks in our move who had had Q clearance; we found it difficult to get people Q cleared quickly enough to have them join in our work.

I say, I am not criticizing the program; I am simply pointing out—I am not criticizing the classification in this case, I do not think that is my prerogative, and I have no criticism of it at any rate, but I am pointing out it did make our work extremely difficult, and I think that the record should show that as a matter of fairness to everyone concerned.

Mr. PETERSON. As I understand it, Mr. Chairman, the question before this committee relates to whether the Federal Civil Defense Administration is being unduly handicapped in its operations by the application of the security regulations of the Atomic Energy Commission.

This is a question which is not susceptible to a "yes" or "no" answer and it should probably be rephrased something as follows:

Is the civil defense program being unnecessarily delayed or handicapped by the security regulations of the AEC?

In planning for civil defense, it is important that we have access to reports of tests of nuclear weapons in order that we may have the fullest possible appreciation of the effects of such weapons in developing our civil defense plans. It is also important that sufficient information on weapons effects be declassified to enable the general public to take appropriate measures of self-protection and to permit State and local civil defense officials who do not have access to classified data to define and develop the State or local civil defense plans.

It is on these two questions that we have frequent relations with the AEC that would be pertinent in today's discussion.

The AEC has furnished rather full information to FCDA by transmitting classified reports on test operations. More than that, the AEC has invited us to participate in their tests.

With respect to the declassification of information that the public may need, we encounter a question which is not as readily resolved as furnishing classified reports to properly cleared people. I need hardly say that I am constantly pressing for the release of more information

to the American people with respect to the effects of atomic weapons. I would be the first to recognize, however, that a careless or irresponsible release might possibly endanger the security of the United States more than it would promote it. It is necessary in preparing information for release to screen very carefully the manner in which it is expressed to be sure that there are no data which a competent scientist could capitalize on to advance the Soviet weapons program.

It is to be expected, therefore, that there will be a certain amount of delay in the declassification of any information since the process involved must be a thorough one, involving careful checks, primarily with our military people and the AEC technicians.

In summary, my natural position is bound to be one of impatience to release information at the earliest possible date. I would be the first, however, to acknowledge the need for great care in this process.

In the release of fallout data, we encountered more than the usual delays for two reasons: Here for the first time we were confronted with a weapons effect that involved reappraisal and review in every phase of the Civil Defense program. Up until this time, for example, we had not found it necessary in 4 years of the agency's existence for our welfare people to have access to restricted data. In this case, it was essential either that they be permitted access to it, or that the data be declassified. It also happened that at about this time the agency moved its headquarters to Battle Creek, Mich. In the course of the move we lost many of our Q cleared stenographers and clerks. As I indicated in my testimony before the Subcommittee on Civil Defense of the Senate Armed Services Committee, this slowed down our operations temporarily. I made this comment for the single purpose of being fair to those people on my staff who were working hard under handicaps to do our part of the declassification job.

I certainly have no bill of complaint against the AEC or its staff. They have been sincerely interested in the Civil Defense program and have been extremely helpful to us. I must concede in passing that if the regular security system were also applicable to access to restricted data this would expedite our work. It would mean that we need not occasionally delay progress because of a suddenly discovered need for Q clearance of a particular individual. I am not prepared to make such a recommendation because I have not studied all of the considerations which the Congress had in mind in enacting the special security requirements contained in the Atomic Energy Act. I make this comment from a somewhat limited point of view and leave it to others to evaluate this in the light of other considerations.

Representative KILDAY. Thank you, Governor, and if you will keep your place we will hear from Admiral Strauss and then have questions for either or both of you.

STATEMENTS OF LEWIS STRAUSS, CHAIRMAN, AND DR. JOHN C. BUGHER, DIRECTOR, DIVISION OF BIOLOGY AND MEDICINE, ATOMIC ENERGY COMMISSION

Mr. STRAUSS. Mr. Chairman, I have been asked to appear before you today to testify with respect to the effects of the AEC security regulations on the program of the Federal civil defense program.

Much information pertaining to the effects of atomic weapons that is useful to the FCDA in its planning is or has been classified. For

FCDA to perform its planning functions the Commission must either grant clearance to certain personnel of the FCDA for access to classified material or the Commission must declassify the data. I think you will find that in either classified or declassified form the information needed for planning has been promptly conveyed to the responsible FCDA officials. We also recognize that in order to have an effective civil defense operating program there must be provided a body of information on weapons effects unclassified and open to any one who will put it to use.

The Commission started declassifying weapons effects information 6 years ago and in 1950, even before the establishment of FCDA, issued an illustrated book of more than 400 pages on this subject. The process of declassifying this kind of information has continued.

Classified or declassified information about the effects of atomic weapons does not move as rapidly into general use as it would if there were no security considerations, but this is one of the consequences of maintaining the security standards required by the Atomic Energy Act.

I feel that Governor Peterson is in a better position than the Commission to advise you on the question concerning the effects of AEC security provisions on his program.

I would like to say that the Commission has recognized the importance of and has assisted the national Civil Defense effort in all ways consistent with the Commission's functions and responsibilities under the law. Our relationships with the Federal Civil Defense Administration have been very satisfactory and I believe we have been able to work out solutions to problems as they arise. I know of no complaints that have been made to the Commission by the Federal Civil Defense Administration on this score.

We have previously submitted a statement in somewhat greater detail on our relationships with the FCDA.

In view of the testimony before the Subcommittee on Civil Defense of the Armed Services Committee and in the hearings of the Senate Subcommittee on Reorganization of the Committee on Government Operations, I am sure that this subcommittee is interested in the Commission's role in the release of the report of February 15, 1955, on the effects of high yield nuclear explosions.

Some of the questions and some of the testimony gives the impression that the Atomic Energy Commission was derelict in its duties and I submit that the facts do not support this conclusion.

I should like to present to this committee a brief outline of the actions we took and the reasons why it was considered not in the national interest to publish the full facts of fallout at a date earlier than mid-February.

The devices detonated at Bikini on February 28 and March 1, 1954, revealed for the first time the extent and nature of the dangers from radioactive fallout from high-yield nuclear explosions.

In early March the public was partially and inaccurately apprised of these new dangers by the publication in a newspaper of a letter from a young marine to his mother. The publication of this colorful account was followed by a brief press release by the Commission on March 11, 1954, confirming that some personnel had been unexpectedly exposed to radioactivity during the atomic tests at Bikini.

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On March 12 Commissioners Smythe, Zuckert, and Campbell and General Nicholas, General Manager of the Commission, General Fields, Director of the Division of Military Application, Dr. Bugher, Director of the Division of Biology and Medicine, gave an oral briefing to your Committee in executive session, during which all of the then known facts were exposed to you.

I returned from the Pacific on the 29th of March and at a news conference at the White House 2 days later I discussed the results of the March 1 test explosion and gave some details about the experience of the Marshallese Islanders and the crew of the Japanese fishing boat *Fortunate Dragon*, insofar as they were then known to me.

These details gave some idea of the extent of the fallout and nature of its dangers.

Additionally, I stated that an H-bomb could now be made large enough to put out of commission the metropolitan area of a city such as New York, and I should like to be permitted to offer for the record a transcript of that news statement.

Representative KILDAY. Without objection it will be included in the record.

(The material referred to follows:)

STATEMENT BY LEWIS L. STRAUSS, CHAIRMAN, ATOMIC ENERGY COMMISSION

The President has authorized me to make available those portions of my report of yesterday to him, the publication of which would not compromise information vital to our national security.

I have just returned from the Pacific Proving Grounds of the Atomic Energy Commission where I witnessed the second part of a test series of thermonuclear weapons. I will describe it as well as I am able, but perhaps before doing so it would be appropriate to begin with a short summary of the historical background.

We detected the test of an atomic weapon, or device, by the Russians in August of 1949. Realizing that our leadership was therefore challenged and that our sole possession of the weapon which had been a major deterrent to aggression had been canceled, it became clear that our superiority would thereafter be only relative and dependent upon a quantitative lead—that is to say, upon our possession of greater numbers of atomic weapons so long as that could be maintained. There was, however, the alternative of a qualitative lead if we could make a weapon of greater force—greater than the fission weapons by a degree of magnitude comparable to the difference between fission bombs and conventional bombs. A theoretical method of accomplishing this was known to our scientists.

In January 1950 the President directed the Atomic Energy Commission to undertake the necessary steps to see if this weapon, variously called the hydrogen bomb, the fusion bomb, and the thermonuclear bomb, could in fact be made. As you know, thanks to the ingenuity of those scientists and engineers who devoted themselves to the project, the feasibility of the fusion reaction was demonstrated and a prototype was tested at Eniwetok in November 1952.

This test produced the largest man-made explosion ever witnessed to that date, and from that point we moved into refinement of design and other development. In August of last year the Russians also tested a weapon or device of a yield well beyond the range of regular fission weapons and which derived a part of its force from the fusion of light elements. There is good reason to believe that they had begun work on this weapon substantially before we did.

The present series of tests has been long in the planning. It is conducted jointly by the Atomic Energy Commission and the Department of Defense. A task force composed of the three armed services and a scientific staff representing the Commission was established last year in accordance with the procedure successfully followed in preceding tests outside our continental limits. The Navy, Air Force, and Army have successively supplied the command for the task forces.

Early this January, men and supplies began to move out to the proving grounds for this series. The first shot took place on its scheduled date of March 1, and the second on March 26. Both were successful. No test is made without a definite purpose and a careful determination that it is directed toward an end result of major importance to our military strength and readiness. The results which the

scientists at Los Alamos and Livermore had hoped to obtain from those two tests were fully realized, and enormous potential has been added to our military posture by what we have learned.

It should also be noted that the testing of weapons is important likewise in order to be fully aware of the possible, future, aggressive ability of an enemy for we now fully know that we possess no monopoly of capability in this awesome field.

Now as to this specific test series. The first shot has been variously described as "devastating", "out of control", and with other exaggerated and mistaken characterizations. I would not wish to minimize it. It was a very large blast but at no time was the testing out of control. The misapprehension seems to have arisen due to two facts. First, that the yield was about double that of the calculated estimate—a margin of error not incompatible with a totally new weapon. (The range of guesses on the first A bomb covered a relatively far wider spectrum.) Second, because of the results of the fallout.

When a large explosion occurs on or within a certain distance of the ground, an amount of earth or water or whatever is beneath the center of the explosion is sucked up into the air. The heavy particles fall out quickly. The lighter ones are borne away in the direction of the wind until they too settle out. If the explosion is a nuclear one, many of these particles are radioactive as are the vaporized parts of the weapon itself.

For this reason the Atomic Energy Commission has conducted the tests of its larger weapons away from the mainland so that the fallout would occur in the ocean where it would be quickly dissipated both by dilution and by rapid decay of most of the radioactivity which is of short duration. The Marshall Islands were selected for the site of the first large-scale tests—Operation Crossroads—for reasons which will be apparent from the maps which I shall show you. The late Adm. W. H. P. Blandy, under whom I had the privilege of serving, selected the Bikini site.

The Marshall Islands during the months of February, March, and April are usually favored by winds which would blow away from any inhabited atolls. The two atolls of Bikini and Eniwetok were chosen as the base for these operations. Each of these atolls is a large necklace of coral reef surrounding a lagoon two to three hundreds of square miles in area, and at various points on the reef like beads on a string appear a multitude of little islands, some a few score acres in extent—others no more than sandspits. It is these small, uninhabited, treeless sand bars which are used for the experiments. As a matter fact, the task force dredged up enough sand and coral to build one of these so-called islands to have it where it was wanted most advantageously for shot No. 1. The impression that an entire atoll or even large islands have been destroyed in these tests is erroneous. It would be more accurate to say a large sandspit or reef.

Before the shot takes place, there is a careful survey of the winds at all elevations up to many thousands of feet. This survey is conducted by weather stations on islands and on fleet units at widely separated points. Contrary to general belief, winds do not blow in only one direction at a given time and place. At various heights above the earth, winds are found to be blowing frequently in opposite directions and at greatly varying speeds. An atomic cloud is therefore sheared by these winds as it rises through them. The meteorologists attempt to forecast the wind direction for the optimum condition and the task force commander thereupon decides on the basis of the weather reports when the test shall be made. The weather forecast is necessarily long-range because a warning area must be searched for shipping and the search which is carried out both visually and by radar in P2V Navy planes requires a day or more to complete.

The warning area is an area surrounding the proving grounds within which it is determined that a hazard to shipping or aviation exists. We have established many such areas as have other governments. This map shows such areas off the Pacific coast at Point Magu, and off the Hawaiian Islands. Here is a large guided-missile warning area from Florida across the Bahamas. Here is one maintained by Great Britain off Australia. Including our continental warning areas, we have established a total of 447 such warning and/or danger areas. This particular warning area was first established in 1947. The United Nations were advised and appropriate notices were carried then and subsequently in marine and aviation navigational manuals.

Despite such notices there are many instances where accidents or near accidents have resulted from inadvertent trespass in such warning areas. The very size of them makes it impossible to fence or police them. For the day of shot No. 1, the meteorologists had predicted a wind condition which should have carried the

fallout to the north of the group of small atolls lying to the east of Bikini. The survey aircraft carefully searched the area and reported no shipping. The shot was fired. The wind failed to follow the predictions but shifted south of that line and the little islands of Rongelap, Rongerik, and Uterik were in the path of the fallout. A Japanese fishing trawler, the *Fortunate Dragon*, appears to have been missed by the search but, based on a statement attributed to her skipper, to the effect that he saw the flash of the explosion and heard the concussion 6 minutes later, it must have been well within the danger area. The 23 crew members on the ship, 28 American personnel manning weather stations on the little islands, and the 236 natives on these islands were therefore within the area of the fallout. The supposition that the actual blast of the bomb extended over such enormous areas is of course entirely incorrect.

The task force commander promptly evacuated all the people from these islands. They were taken to Kwajalein where we maintained a naval establishment and there placed under continuous and competent medical supervision. I visited them there last week. Since that time, it has been determined that our weather personnel could be returned to duty but are still being kept on Kwajalein for the benefit of further observation. None of the 28 weather personnel have burns. The 236 natives also appeared to me to be well and happy. The exceptions were 2 sick cases among them, 1 an aged man in advanced stages of diabetes, the other a very old woman with crippling arthritis. Neither of these cases have any connection with the tests. Today, a full month after the event, the medical staff on Kwajalein have advised us that they anticipate no illness, barring of course disease which might be hereafter contracted. One child has been born in the group and others are expected.

The situation with respect to the 23 Japanese fishermen is less certain due to the fact that our people have not yet been permitted by the Japanese authorities to make a proper clinical examination. It is interesting to note, however, that the reports which have recently come through to us indicate that the blood count of these men is comparable to that of our weather station personnel. Skin lesions observed are thought to be due to the chemical activity of the converted material in the coral rather than to radioactivity, since these lesions are said to be already healing. The men are under continual observation by Japanese physicians, and we are represented in Japan by Dr. Morton of the Atomic Bomb Casualty Commission and Mr. Eisenbud of the Atomic Energy Commission.

With respect to the stories concerning widespread contamination of tuna and other fish as the result of the tests, the facts do not confirm them. The only contaminated fish discovered were those in the open hold of the Japanese trawler. Commissioner Crawford of the United States Food and Drug Administration has advised us: "Our inspectors found no instance of radioactivity in any shipments of fish from Pacific waters. Inspections were undertaken as a purely precautionary measure * * *. There is no occasion here for public apprehension about this type of contamination." I should perhaps note that in the waters around Bikini and Eniwetok at certain seasons of the year, almost all fish caught are normally poisonous as a result of feeding on certain seasonally prevalent micro-organisms, and the natives and out Task Force personnel do not eat them at such times.

In the matter of idemnifying the Japanese, our Government has informed the Japanese Government that it is prepared to agree to reimbursement for such financial assistance as the Japanese Government and our Embassy in Tokyo jointly, may find necessary as an interim measure to give to the persons involved for current medical care and family relief, including wages.

With respect to the apprehension that fallout radioactivity would move toward Japan on the Japanese Current, I can state that any radioactivity falling into the test area would become harmless within a few miles after being picked up by these currents which move slowly (less than 1 mile per hour) and would be completely undetectible within 500 miles or less.

With respect to a story which received some currency last week to the effect that there is danger of a fallout of radioactive material in the United States, it should be noted that after every test we have had and the Russian tests as well there is a small increase in natural background radiation in some localities within the continental United States, but, currently, it is less than that observed after some of the previous continental and overseas tests, and far below the levels which could be harmful in any way to human beings, animals, or crops. It will decrease rapidly after the tests until the radiation level has returned approximately to the normal background.

A recent comment which I have been shown has suggested that the incident involving the fallout on inhabited areas was actually a planned part of the operation. I do not wish to comment on this other than to characterize it as utterly

false, irresponsible, and gravely unjust to the men engaged in this patriotic service.

Finally, I would say that one important result of these hydrogen bomb developments has been the enhancement of our military capability to the point where we should soon be more free to increase our emphasis on the peaceful uses of atomic power—at home and abroad. It will be a tremendous satisfaction to those who have participated in this program that it has hastened that day.

Mr. STRAUSS. News coverage of the statement, together with publication of reports from Japan about the injuries of the crew of the *Fourtunate Dragon* certainly alerted the American public to the hazards from fallout although data then available for release were far from complete. You will recall that the tests in the Pacific proving grounds continued until May 13 when the last shot was fired. By about June first our scientific personnel who had been observing the tests returned to the United States and it was then possible to begin the evaluation of all of the data collected during the entire series of the tests.

However, before the end of May the Armed Forces special weapons project group completed Report No. 507, Technical Analysis Report, which was published the same month under the title "Radioactive Fallout Hazards from Surface Bursts of Very High Yield Nuclear Weapons."

Copies of this classified report were circulated in the Department of Defense and the Commission.

Representative COLE. Mr. Chairman, may I interrupt to make certain of this. When you say that this report was published you do not mean that it was available to the public?

Mr. STRAUSS. No, Mr. Cole.

Representative COLE. Or do you?

Mr. STRAUSS. I thought that the statement that it was a classified report and that it was circulated in the Department of Defense and the Commission would indicate, as was intended, the limitation on its circulation at that time. Subsequently, as I shall show, it did reach the Federal Civil Defense Administration.

Before the end of May the staffs of ODM, of the FCDA, DOD, Departments of Defense, and the Commission began studies of the problem of dispersal with the end in view of recommending new standards which the Federal Government could recommend to industry based upon the information derived from the Bikini tests.

Mr. Corsbie of the Atomic Energy Commission gave an informal classified briefing on fallout hazards to Federal Civil Defense Administration staff members on June 29, 1954, and the Armed Forces special weapons project gave a formal classified briefing to Federal Civil Defense Administration personnel on July 8 and on that same date 4 copies of the technical analysis report No. 507, to which I have just referred, were sent to the Federal Civil Defense Administration.

In August your committee appointed a panel headed by General Wedemeyer to study problems of continental defense and members of your staff conferred with the Commission staff on September 1 and September 15 about the problems of fallout and specifically as to what information had been provided to the Federal Civil Defense Administration.

Mr. Scoville of the Armed Forces special weapons project briefed the Wedemeyer panel on August 31 and described at considerable length the dangers and problems associated with fallout.

During the first week of September the general manager of the Commission discussed with me ways and means by which the facts on fallout could best be presented to the National Security Council at the OCB for their judgment as to the advisibility of issuing a full statement at that time.

The problem of fallout was completely tied in with the problem of dispersal and the change in the national policy with respect to dispersal was then under consideration by the Office of Defense Mobilization, the Federal Civil Defense Administration, Department of Defense, and the Commission.

Representative COLE. Mr. Chairman, for the record we should indicate the agency which you identified by the initials OCD.

Mr. STRAUSS. The OCD is the Operations Coordinating or Coordination Board, I am sorry I am not sure about the last syllable of the second word. It is either coordination or coordinating.

Representative COLE. It is a new one to me.

Mr. STRAUSS. In mid-September a special interagency task force was appointed to prepare a staff study for submission to the heads of those agencies with the end in view of making appropriate recommendations. The Commission was advised currently of the problem of this study. The preliminary study was completed in October. It was recommended in early November by the heads of the agencies associated in the study that the Atomic Energy Commission should prepare a separate report dealing with fallout for the guidance of the Federal Civil Defense Administration and for release to the public at an appropriate time.

On September 23 Dr. John C. Bugher, head of our Division of Biology and Medicine, delivered a speech at Houston, Tex., to the Seventh Annual Industrial Health Conference dealing generally with the medical effects of atomic blasts and specifically with the major medical aspects of fallout, including genetic as well as somatic effects.

The speech received wide press coverage and a large number of copies were distributed throughout the United States both by the Commission and the Federal Civil Defense Administration.

I would like to offer for the record, Mr. Chairman, a copy of Dr. Bugher's speech.

Representative KILDAY. Without objection it will be received for the record.

(The speech referred to follows:)

SPEECH BY DR. JOHN C. BUGHER, DIRECTOR, DIVISION OF BIOLOGY AND MEDICINE, UNITED STATES ATOMIC ENERGY COMMISSION, DELIVERED AT SEVENTH ANNUAL INDUSTRIAL HEALTH CONFERENCE, HOUSTON, TEX., SEPTEMBER 23, 1954

THE MEDICAL EFFECTS OF ATOMIC BLASTS

To comprehend the magnitude of the medical problems of atomic attack, it is imperative that we know the fundamentals of the types of weapons and the range of power that may be anticipated in any action brought against this country. While it is obviously impossible to disclose in any detail our own capability, President Eisenhower in his historic speech before the U. N. General Assembly, December 8, 1953, said:

"Atomic bombs today are more than 25 times as powerful as the weapons with which the atomic age dawned, while hydrogen weapons are in the ranges of millions of tons of TNT equivalent."

Subsequently, there was released the documentary film of the first full-scale thermonuclear test at Eniwetok on November 1, 1952. This tremendous explosion, resulting in a fireball over 3 miles in diameter, created a large crater in the

reef with the lifting of millions of tons of water and coral into the skies. With the earlier announcement, for an experimental device at Nevada, of a yield of 15,000 tons of TNT equivalent, or 15 kilotons, and the original estimation of the Nagasaki bomb at 20 kilotons, it is apparent that we may consider our family of weapons in a great range of possible yields and modes of delivery.

What do these units of energy mean? What is implied by the words "kiloton" and "megaton"? Commission Chairman Strauss in a recent address used an illuminating example. During World War I the city of Halifax was devastated by the explosion of a munitions ship in the harbor having aboard over 2,000 tons of high explosives. Not only was there enormous property damage but approximately 10,000 people lost their lives or were injured. This blast, in nuclear-weapons terminology, had an energy equivalent to slightly more than 2 kilotons, a very small explosion in these terms. The so-called nominal bomb of 20 kilotons releases approximately 10 times the energy of a Halifax explosion while our largest fission bombs will yield the energy of 250 such ships all consumed in 1 gigantic detonation.

But when we speak of the thermonuclear weapons, a still larger unit becomes convenient. This is the megaton or 1,000 kilotons of TNT equivalent. One megaton would thus be represented by the explosion of a line of such ships bow to stern extending for 20 miles.

With such a great range of possible energy yields, how many we relate the effects of one explosion to those of another of entirely different level of power? The volume, The Effects of Atomic Weapons, published in 1950, was written before these very large weapons had been tested. The yield of 20 kilotons was taken as the basis for the book and extensive data were given for this so-called nominal bomb. The existence of yields other than this was not implied but scaling laws which should serve to predict the effects from other yields were included. Without entering into a discussion of the degree to which these laws apply to all situations, we may use them with confidence as being sufficiently descriptive for civil-defense needs. Since we are especially interested in blast, thermal effects, and nuclear radiation, the following equations may be used to relate these quantities for any yield (W) in kilotons to the corresponding values given in The Effects of Atomic Weapons for the nominal bomb.

$\frac{r_1}{r_2}=\left(\frac{W_1}{W_2}\right)^{1/3}$ Where r_1 and r_2 are distances for a given pressure characteristic.

$\frac{Q_1}{Q_2}=\frac{W_1}{W_2}$ Where Q is total radiant energy (thermal or nuclear) at a given distance.

$\frac{t_1}{t_2}=\left(\frac{W_1}{W_2}\right)^{1/3}$ Where t is the duration of the blast wave.

In certain respects, subsequent tests have shown some of the quantitative statements in the original volume to be in error. These will be corrected in the next revision. The most important of them are noted here.

The description of the atomic explosion by now should be familiar to all. At the moment of energy release a bomb is represented by a small sphere of intensely radioactive material of exceedingly high temperature and under enormous pressure. The mass rapidly expands spherically into the fiercely luminous fireball which then ascends at a high rate of speed. Energy is delivered as blast, heat, and radioactivity.

BLAST EFFECTS

The shock wave characteristically has a very sharply rising front with a prolonged positive pressure phase followed by an even longer negative phase. The time characteristics of this typical shock wave follow from the scaling laws mentioned so that with small explosions, such as those of a few tons of TNT, the wave form is sharp and of short duration while with megaton detonations the blast pressure may be exerted for several seconds.

Experiment has shown that the effects of blast with nuclear detonations do not differ qualitatively from those found with high explosives. Surprisingly high-peak pressures may be tolerated without fatal injury provided the attendant accelerations are prevented or minimized. While overpressures of 5 pounds per square inch may occasionally rupture the eardrum, several times this figure may, in some situations, not cause serious injury. In animals subjected to 15–25 pounds per square inch overpressure, small petechial hemorrhages in the lungs and in the gastrointestinal and urinary tracts are frequently found. Eardrum

rupture is then almost a constant finding and transient central nervous system disturbances and concussion may be observed.

Upon exposures to very high overpressures, both animals and man may be killed immediately or within a few minutes. The associated pathology is usually as follows:

1. Cardiac contusion. Commotio cordis.
2. Entrance of air into the pulmonary venous circulation with cerebral or coronary air embolism.
3. Respiratory tract hemorrhage.
4. Pulmonary edema.
5. Sinus and middle ear hemorrhage.
6. Ruptured eardrums and disruption of the ossicles of the middle ear.
7. Trauma to distended hollow viscera.
8. Central nervous system hemorrhages.

The degree of injury from the direct action of blast appears to be dependent upon both the peak pressure (fig. 1) and the duration of the pressure wave.

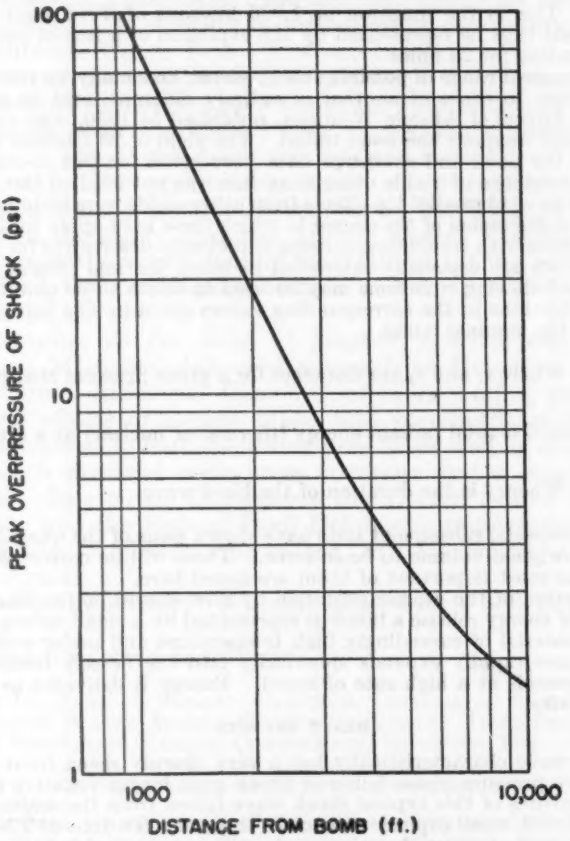

FIGURE 1. Peak overpressure in shock wave as function of distance from atomic explosion, 20 KT.

Overpressures are accompanied by momentary winds of high velocity reaching 170 miles per hour for 5 pounds per square inch. Individuals not restrained may be thrown violently for considerable distances and inanimate objects may be accelerated to become missiles capable of causing very serious injury. It appears that the blast-peak pressure is in itself of less danger than the mechanical trauma occasioned by the drag forces on detachable objects.

For these reasons it is our present view that the problem of blast injury is closely related to the blast damage of structures and will therefore be more or less coextensive with the area of light to moderate damage to buildings. Material such as glass, which may be easily fragmented and readily accelerated to high velocities, may be anticipated to be a great source of injury from blast. The wounds and other traumatic manifestations of such missiles are well known.

THERMAL RADIATION EFFECTS

Since the publication of the Effects of Atomic Weapons, laboratory and field experiments have given much more adequate information that burning is due to energy in the infrared and visible portions of the spectrum with no significant contribution from the ultraviolet. About one-half of the thermal injury is caused by the infrared rays, the remainder being attributable to radiation in the visible range.

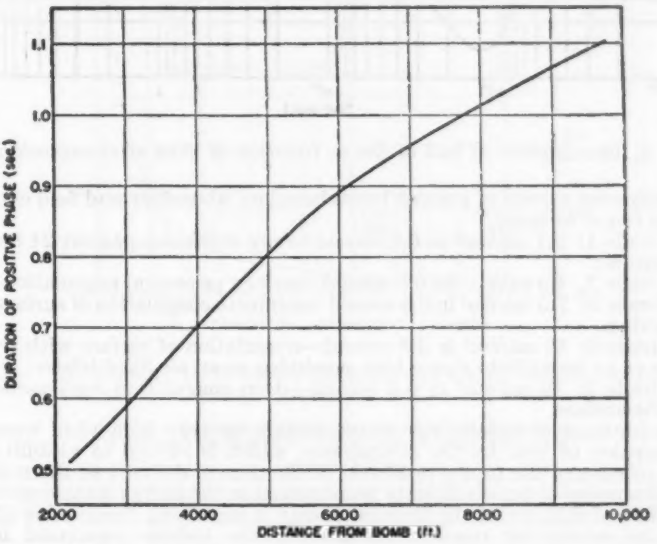

FIGURE 2. Duration of positive phase of shock wave as function of distance, 20 KT.

Burns produced by a fission bomb differ in no respect from those due to any high intensity heat of short duration. As far as the thermal injury itself is concerned, the treatment presents the same problems as do similar injuries from other heat sources.

With respect to the time interval of the thermal radiation emission during which burns may be produced, for yields which are relatively small multiples of the nominal bomb, it has been found that—

(*a*) There is no burning in the first 0.025 second following detonation.

(*b*) The major severity of thermal burns is attained within the first 0.3 second after detonation.

(*c*) No burns are produced after 0.6 second if the skin is protected prior to that time.

(*d*) There is good relationship between the measured thermal energy and that determined by evaluating the skin burns from laboratory standards during the first 0.3 second.

(*e*) No difference in severity between small and large area burns occurs when other conditions are equal.

(*f*) In animals, moderate burns have been found to heal at normal rates despite the development of irradiation sickness.

For the nominal bomb, the time from detonation to the second maximum of fireball illumination is approximately 200 milliseconds (0.2 second) (fig. 3). With larger yields, this duration of the thermal pulse increases and may be as great as several seconds for very large yields.

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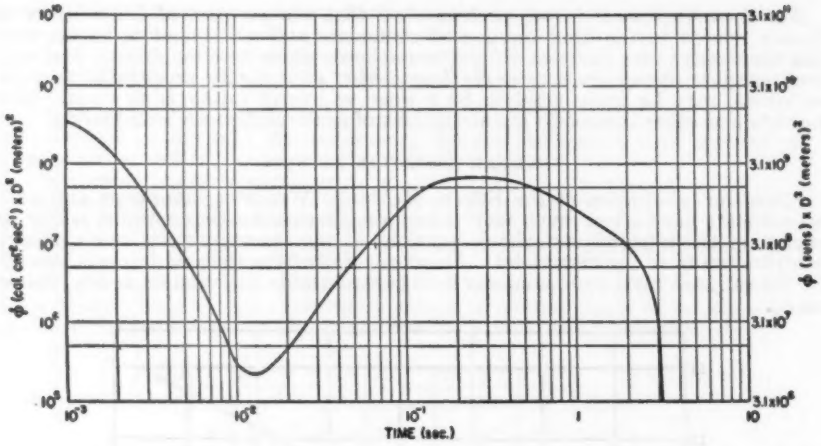

FIGURE 3. Illumination of ball of fire as function of time after explosion, 20 KT.

The following system of grading burns based on laboratory and field experiments has been found to hold:

Grade 1: 2.3 cal/cm² in 0.3 second—only erythema present 24 hours after exposure.

Grade 2: 4.5 cal/cm² in 0.3 second—patchy or central coagulation necrosis.

Grade 3: 7.5 cal/cm² in 0.3 second—complete coagulation of surface without charring.

Grade 4: 10 cal/cm² in 0.3 second—coagulation of surface with the formation of an immediate steam bleb persisting as an air-filled blister.

Grade 5: 19 cal/cm² in 0.3 second—deep coagulation with carbonization of the surface.

The additional considerations which pertain to very high yield weapons are the absorption of heat by the atmosphere, which is related to visibility (fig. 4) and the relation of the injury produced to the time of delivery of thermal energy. The total amount of heat is directly proportional to the energy release of the bomb. As the time of delivery of the thermal energy is increased, the number of calories per square centimeter required to produce the lesions mentioned increases. With very large yield weapons the figures given for the 0.3 second of delivery must be augmented by 50 to 100 percent. The scaling laws given and the considerations derived by experiment lead to the following approximate values for thermal flux in calories per square centimeter at various distances and under specified conditions of visibility.

TABLE I.—*Distances in miles at which certain total thermal energies are delivered related to yield and visibility*

Energy release	Visibility, 4 miles (see fig. 5)		Visibility, 35–40 miles (see fig. 6)	
	3 cal/cm²	10 cal/cm²	3 cal/cm²	10 cal/cm²
20 KT	1.3	0.8	2.2	1.3
100 KT	2.2	1.5	4.3	2.8
1 MT	3.5	2.7	10.0	6.8
10 MT	4.8	4.0	17.0	13.0

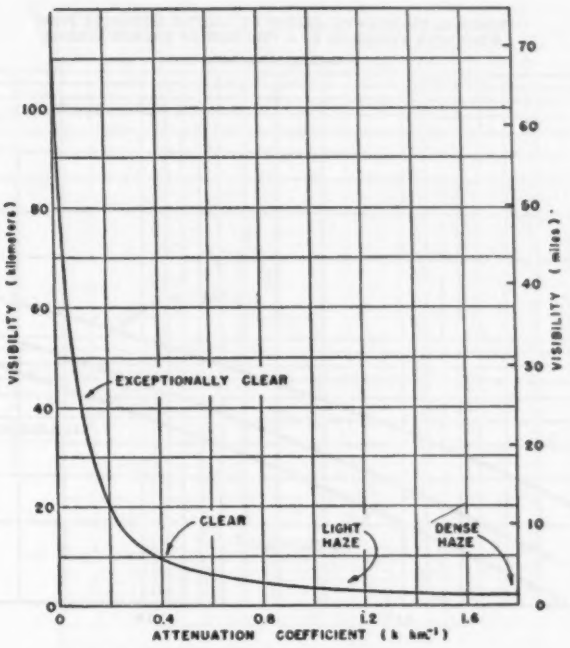

FIGURE 4. Attenuation coefficient of radiation by air as function of visibility.

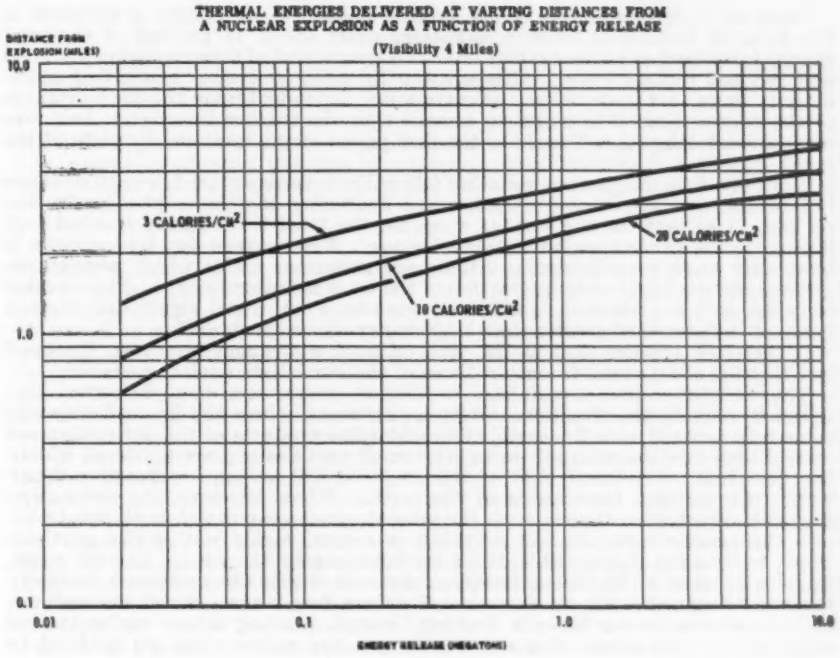

FIGURE 5

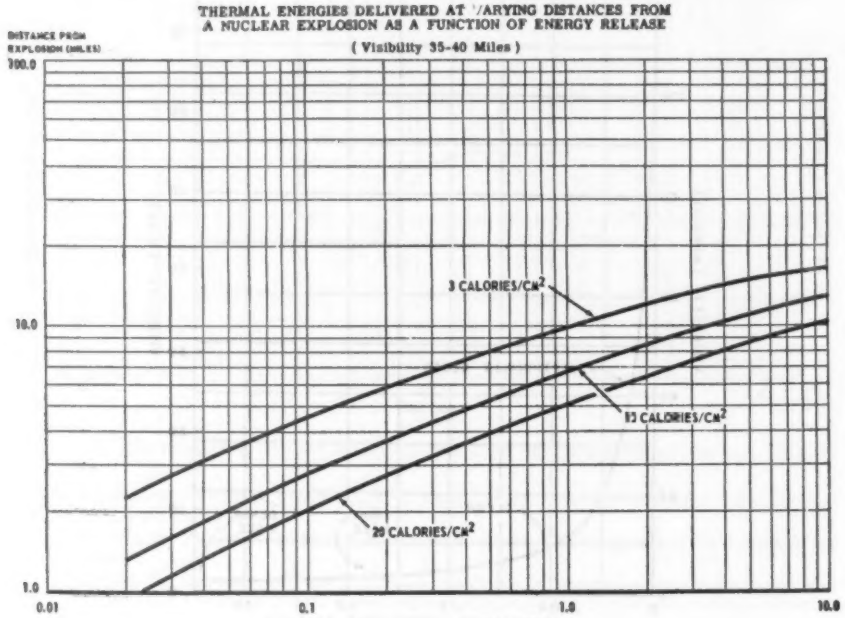

FIGURE 6

NUCLEAR RADIATION

From an exploding atomic bomb, about 6 percent of the energy is delivered in the form of immediate nuclear radiation, while about 11 percent of the total energy is released as nuclear radiation over a long period of time by fission products and induced radioactivity. Although the intensity and total amount of radioactivity in an area under attack are very much dependent upon the circumstances of the dentonation, it is useful to assume that the total radioactivity, both immediate and delayed, will scale as the first power of the total energy yield of the bomb.

Not only does the gamma radiation follow the inverse square law with distance but in addition there are absorption and scattering of gamma photons by the air (fig. 7) so that for the smaller weapons, the total transmission is effectively limited to the general region of blast damage. The neutron flux transmission is inherently more complicated and there are situations under which neutron exposure may contribute a large fraction of the total radiation injury. The reaction of neutrons in air, however, is such that one would not expect significant neutron fluxes at a distance of greater than 1,500 meters from the fireball.

It therefore appears that as the yield of nuclear weapons increases, the blast and thermal effects tend to outrun those of the immediate nuclear radiation.

The delayed nuclear radiation mentioned previously may, however, significantly modify the situation. With an air burst, where the fire ball does not come into contact with the earth, the radioactive products of the detonation are carried high into the atmosphere as very small particles and are scattered widely by the winds. The great bulk of this material will undergo radioactive decay before the particles have fallen to the earth. When, however, the detonation is such that the fireball rests upon the ground, great amounts of earth are drawn into the rapidly rising fireball resulting in coarse, highly radioactive particles which tend to fall rapidly while being carried along by the wind. In such cases, there is an area of highly radioactive fallout in which the maximum intensity may be lethal following an exposure of only a few hours. Small detonations, such as are fired at the Nevada Proving Ground, produce severe contamination extending for only a few miles and the dangerously active areas are confined to

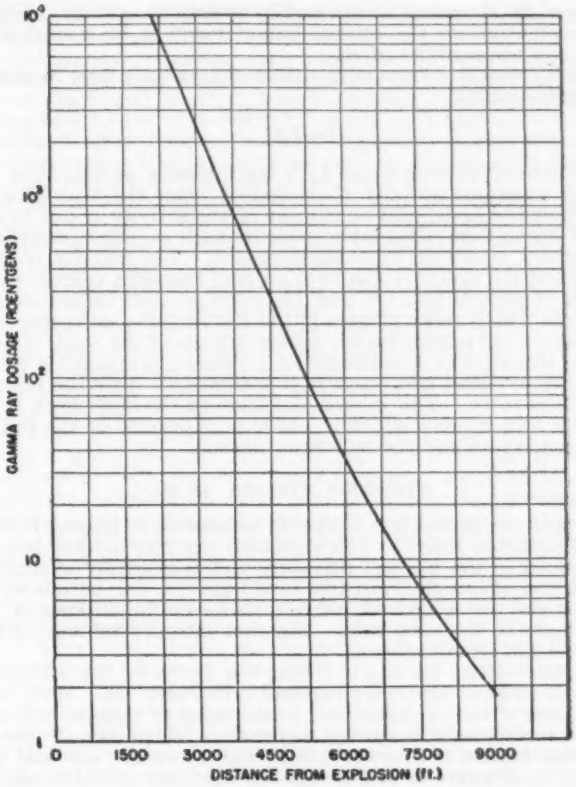

FIGURE 7. Total dosage of initial gamma radiation as function of distance from explosion

the controlled bombing range. The dimensions and shape are determined by the whole complex of wind patterns but characteristically there is a narrow fan in which the area of highest contamination has a somewhat elliptical shape. Upwind and cross-wind contaminations are limited in extent and are far less spectacular in intensity.

As the yield increases so that the radioactive cloud ascends to greater heights the area of fallout is correspondingly extended. The computation of the dimensions depends upon a knowledge of the direction and velocity of the winds in the successive levels of the atmosphere up to and including that of the top of the cloud. The scaling is therefore not simply dependent upon the size of the explosion but upon many other circumstances associated with it. The very large large thermonuclear device tested at Bikini Atoll on March 1, 1954 gave an elongated cigar-shaped area of contamination extending approximately 220 statute miles downwind and varying in width up to 40 miles. The total area of dangerous contamination was approximately 7,000 square miles within this area. Survival would have depended upon prompt evacuation or upon taking shelter and other protective measures. The contamination was variable and near the main axis of the elliptical pattern exposure would have been lethal within a few hours.

For either an air burst or a surface burst, the radioactive material which does not descend quickly is carried by the winds prevailing at the various altitudes so that the fallout of this finely divided particulate material is determined by the wind trajectories and the particle size, the latter greatly influencing the velocity of fall. When such material descends sufficiently to enter the rain cloud bearing level, usually below 20,000 feet, the fallout to the earth may be accelerated by rain or snow, and it is common to find, following a detonation, that rainwater

from regions of cloud passage shows readily detectable activity. Other than such incidental concentrations the general fallout tends to be remarkably uniformly distributed over the earth's surface.

Radioactivity resulting from detonations decays with time in accordance with the following equation:

$$I = I_o t^{-1.2}$$

where I is intensity at time t and I_o is the intensity at unit time The significance of any measured activity is dependent upon the time since detonation. Within the first few hours and days most of the activity is due to radioisotopes of short half-life so that radioactive elements such as iodine, molybdenum, ruthenium and many others may be demonstrated. The activity of such elements is soon gone and the exposure due to them is of transient character.

It may be of general interest that the average total fallout over the United States from the Castle series of tests in the Pacific this past spring has amounted to approximately 100 millicuries per square mile as of the week of September 23, 1954. While this amount of radioactivity is minute, it is possible with techniques available today to detect and measure it accurately. This has been done for all regions of the country. The gamma radiation to the body from this materal is approximately 0.01 mr/day which is less than 5 percent of the radiation to the body from cosmic rays and the radium in the soil.

RADIATION EFFECTS IN MAN

In the present discussion, it is obviously impossible to present in any detail the pathology of radiation injury. This extremely complex subject has been voluminously developed in the medical literature and is generally available. The important radiation effects fall into two broad groups, one pertaining to the individual himself and the second related to questions of inheritance of the results of radiation damage to the germ cells. The first category we may call the somatic and the second the genetic effects.

Somatic effects—Here we must distinguish between the effects of external irradiation and those of internally ingested bomb residues. With respect to the immediate region of the explosion and to the areas of close-in radioactive fallout in the case of surface or near surface detonations let me say at once that the external radiation hazard is overwhelmingly the important one and the ingestion of radioactive bomb products in this region is relatively trivial in comparison with the external hazard.

The effects of external radiation are not qualitatively greatly different for the various types of nuclear radiation but the regions and tissues of the body affected are very much dependent upon the physical characteristics and energies involved. Thus the highly energetic gamma and neutron radiations penetrate the entire body while the soft gamma rays and beta radiation have only limited penetration through the skin. Alpha radiation is of no external consequence because of its extremely limited penetration.

The immediate effects of whole body gamma radiation are determined by the dosage received and the rate of delivery. The systems most fundamentally affected are the central nervous system, the blood-forming organs and tissues, and the gastrointestinal tract. The time of onset of symptoms may vary from a few minutes for extremely high doeses delivered very rapidly to several weeks for smaller doses delivered more slowly. In general our previously published figures for 50 percent lethality at approximately 400 roentgens of immediate gamma radiation from the bomb still seem accurate. Transient depression of white cells and platelets may be detected readily at an exposure of 50 roentgens, and nausea and vomiting will occasionally be found with whole body doeses as low as 100 roentgens.

Where the dose is delivered over several days, the amount of radiation to produce death in 50 percent of those exposed becomes increased by about 25 percent.

In the case of the local radioactive fallout in the vicinity of a bomb exploded on the surface, about one-half of the total possible radiation dose is delivered within the first 24 hours. Measures to prevent or limit such exposure must therefore be undertaken promptly if they are to be effective.

Exposures in the region of 200 roentgens of whole body gamma radiation may cause such a depression of white cells that antibiotics are required to block secordary infections. A decrease in platelets to below 30,000 per cubic millimeter may lead to purpura requiring the use of platelet transfusions, a procedure which is still experimental.

Whole blood transfusions, especially those from many donors, introduce hazards such as those from incompatibility and from infectious hepatitis. Save in a situation of the utmost urgency, repeated small transfusions from different donors may create more hazard than that from the original radiation exposure. During the last spring, when nearly 300 Marshall Islands and task force personnel were accidentally exposed in a fallout of the type discussed, no transfusions were used although in some cases white blood cell and platelet counts reached disturbingly low levels. With conservative therapy and good nursing, all have recovered and there have been no instances of jaundice or liver involvement.

Gamma and neutron exposures near lethality may also be expected to cause some delayed manifestations. The joint Japanese-American studies by the Atomic Bomb Casualty Commission at Hiroshima and Nagasaki have shown that within the range of neutron flux there is an appreciable incidence of cataracts among the survivors. Also among those who apparently received a heavy gamma radiation exposure, there has been a significant increase in myelogenous leukemia. Because of the rarity of this disease, even the increase in frequency of from 10 to 20 times over the Japanese normal would not have been recognized if these studies had not been made over the entire surviving population of the 2 cities.

A third possible delayed effect of radiation exposure which has been demonstrated in animals is a statistical shortening of life expectancy. This phenomenon does not result from any specific cause of death but apparently from a general acceleration of the aging process. Whether this factor can be recognized in a human population is as yet unknown. For it to become a significant consequence of sublethal radiation exposure, it would seem necessary that all causes of death operating in earlier years would have to be sharply suppressed.

As stated previously, within the region of the detonation and the associated early fallout in the case of surface bursts, the evidence has been overwhelming that the hazard from inhaled or ingested radioactive material is inconsequential compared to the external gamma dose to the whole body and beta-gamma dose to the skin. More remotely, however, after decay of the isotopes of very short half lives, some radio-elements such as I^{131} become of significance. Because of the surface contamination of foliage and the high rate of assimilation of iodine from the gastrointestinal tract, it is not difficult to demonstrate the presence of such radioactive material in the thyroids of grazing animals for several weeks after a detonation. The amounts acquired by man are in general much smaller than by sheep and cattle in the same areas. The radioactive iodine decays rapidly and the actual radiation exposure, even to the thyroid where the material is concentrated, is only a minute fraction of that capable of producing recognizable damage. The average exposure from this cause to the people of the United States from the fallout of the entire series of tests this past spring was substantially less than 10 percent of that accepted as permissible for continuous exposure over an entire year.

Somewhat more complicated is the subject of radiosiotopes of long half life that enter into biological processes and food chains. Some of these, such as strontium-90 have an especial affinity for the skeleton and thus present a problem somewhat analogous to that of radium. Fortunately, we have a growing mass of precise information concerning the quantitative relations between ingested radium and thorium and the subsequent development of bone pathology.

The most important result of the presence of excessive amounts of radium in the skeleton is the increase in frequency of osteogenic sarcoma and it is presumed that the most important effect of the ingestion of considerable amounts of Sr^{90} would be tumor production. The amount required to produce such an effect is obviously considerable. I estimate that the amount of such material now present over the United States would have to be increased by the order of 1 million times before an increased frequency of bone sarcoma from this cause could be recognized.

Genetic effects.—Radiation may not only damage the somatic cells but by acting upon certain stages of the germ cells may give rise to alteration of the genes upon which inheritance depends. It appears to be well established that there is no definite threshold for this effect and that there is a linear relationship between the frequency of the gene changes and the total irradiation. At the present time, it seems that the rate at which the radiation is given is a minor and perhaps negligible factor.

The quantitative studies have necessarily been made with relatively high exposures varying from a minimum of 50 roentgens with mice to a maximum of several thousand roentgens in the case of the more resistant fruitfly. Each species has its own range of sensitivity.

If one assumes that the linear relationship which has been experimentally determined holds for all exposures however small, then the extrapolation of the data

leads to the conclusion that a small but finite probability exists for gene mutations at the level of the radioactivity of the natural environment. That mutations do occur in all living things is well established and indeed forms the basis for all evolution. At present, however, we do not know to what extent the normal mutation frequency is caused by the radioactivity of the natural environment and what is due to other factors.

The second area of uncertainty has to do with the ultimate effect of mutation rates on the welfare and survival of populations. Since many of the important mutations appear to be dominant lethals, their estimation has to be based, not upon the recognition of anomalous characters, but on the estimation of the numbers of individuals who should exist but in fact do not. The technique, which is very useful in laboratory experiments with animals, becomes very difficult of application to a human population for obvious reasons.

Some of the mutations may be recessive and consequently not be detectable until at some future time when an individual carrying such a mutant gene should mate with another individual carrying the identical factor.

The mere occurrence of mutations may be only part of the problem. The fate of the mutations in populations is the important question. These mutations will be subjected to the same forces of natural selection that now act against spontaneous mutations.

The extremely complicated and difficult genetic problem in man constitutes a very important section of the studies being conducted in Japan. No firm conclusions can be given until the statistical work is finished but it seems likely that some evidence of genetic effect will have been obtained among the more highly irradiated survivors at Hiroshima and Nagasaki. At the lower exposure rates, it is quite evident that no changes can be recognized.

This genetic problem which is one of the fundamental aspects of the adjustment of man to the world of the future, is sometimes thrown into confusion by reckless and uncritical pronouncements based upon assumptions which go far beyond our knowledge. We have dire predictions of many monsters and even the obliteration of mankind itself from radiation exposures which are only a small fraction of that from cosmic radiation, from the radium and radon of the soil and air, and from the naturally radioactive potassium and carbon of which we all are partially composed. It is most essential that we keep our perspective in such matters and base our generalizations on substantial evidence.

To summarize this most complicated subject of the medical effects of atomic blasts is simply to restate some of the outstanding aspects. Any future general war may be fought predominantly with nuclear weapons. These are weapons of mass destruction which follow from the clear demonstration of World War II that the outcome of modern war is to a large extent determined by the industrial productivity of a nation and the ability of a people to withstand great losses and yet hold firm.

The fundamental problem is the prevention of war. It is not to be resolved by negotiation dealing with a particular type of weapon.

We must face the tremendous medical and social problems involved in atomic warfare. Not only must we be prepared for blast and thermal casualties on a scale never before conceived in warfare but we must recognize that these weapons may also be used for their radiological effects to deny the continued use for appreciable lengths of time of large areas outside the zones of immediate damage.

The basic scientific and technical knowledge that is necessary is at hand and rapidly growing. Our greatest task at the present time is the further application of this knowledge in our defense systems, both military and civil.

Mr. STRAUSS. Further evidence of the Commission's attitude toward release of information about fallout is to be found in the speech delivered on December 2 last to the Washington Conference of Mayors in this city, by Commissioner Libby. Much work on the evaluation of its material was given to this speech by Dr. Libby and members of the staff of the Commission in the desire for the maximum accuracy and the maximum completeness possible at that time.

This speech dealt not only with the dangers of fallout but included advice as to how people could protect themselves by taking shelter.

I would like with your permission to offer for the record a copy of that speech.

Representative KILDAY. Without objection, it will be inserted in the record.

(The speech referred to follows:)

SPEECH BY DR. WILLARD F. LIBBY, COMMISSIONER, UNITED STATES ATOMIC ENERGY COMMISSION, DELIVERED AT THE WASHINGTON CONFERENCE OF MAYORS, WASHINGTON, D. C., DECEMBER 2, 1954

THE ATOMIC ENERGY COMMISSION AND NATIONAL SECURITY

The Atomic Energy Commission has two primary functions insofar as national security is concerned. The first of these, of course, is to provide the Nation with atomic weapons in the quantity and qualities necessary, and the second probably could be described as a responsibility to help the Federal Civil Defense Administration in civilian defense. Certainly atomic war makes the civilians participants in a very real sense, and the means of defense are in many ways as technical and unfamiliar and bizarre, as the atomic offensive techniques. Of course, the Commission has other duties as well—the peacetime applications of atomic energy to power and the use of isotopes in medicine and industry, the promotion of the general welfare through the encouragement of research and development in the sciences, and others. But these I do not interpret as bearing directly on the national security in the sense of supplying weapons to the military and assisting the public in civilian defense. Of course the other objectives are vital to national security in a broader sense, but in the sense in which we speak of the immediate responsibilities, the two cited are the principal obligations and objectives. I shall not speak of the weapons program today but shall discuss some of the problems of civilian defense.

A considerable amount has been written and published about the blast and heat effects of fission and thermonuclear weapons. We all have seen the dramatic motion pictures and photographs of the damage wrought in the Japanese cities. Many probably have read the publication, The Effects of Atomic Weapons, which details in a very fundamental way the principles of the damage wrought by atomic weapons. A revised edition of this useful handbook is now underway. The blast and heat effects were in a general way not too surprising. The predictions made before the atomic bombs were actually realized proved to be fairly accurate. This was due of course to the great experience the world had had with ordinary explosives and to the general applicability of the laws of physics underlying the propagation of shock waves and their effects on matter, and the understanding of the transmission of heat which had been acquired before 1945. In contrast, however, to the blast and thermal effects, the effects of the radioactivity of the atomic weapons were not so well predicted. We shall discuss these this afternoon.

The world is radioactive. It always has been and always will be. Its natural radioactivities evidently are not dangerous and we can conclude from this fact that contamination from atomic bombs, small in magnitude or even of the same order of magnitude as these natural radiations, is not likely to be at all dangerous. The second general point is that whereas heat and blasts are difficult to counter, the radiological hazard of atomic weapons is something one can do something about. This, of course, is extremely well known to the Federal Civil Defense Administration which has spent a great deal of time worrying about it.

Radioactive radiations are extremely varied in nature, some being very feeble in penetrating power, hardly able to traverse the thinnest sheet of paper, and others being capable of passing through several feet of concrete. The softest radiations are relatively harmless in general, at least the soft radiations exhibited by the radioactivities due to atomic weapons. We find, for example, that the tritium—radioactive hydrogen—from thermonuclear weapons constitutes no hazard to the world's population, principally for this reason. Of course it is true that the tritium from such weapons burns to form water and the human body passes water through it very rapidly. Also, of course, there is a great deal of water in the world to dilute any tritium introduced in the atmosphere. For the reason of the softness of the radiation and the short biological lifetime for water molecules in the human body, the human tolerance for this radioactive product is estimated to be at least 10 millicuries under conditions of continuous exposure, that is, one can drink radioactive water at such a concentration as to maintain a net inventory of 10 millicuries of this isotope in the body with no effects to be expected. For a single exposure, the tolerances are probably in the order of

1,000 millicuries. Analogous tolerances for some other isotopes are about a millionfold lower. In other words, the tolerances, the number of disintegrations per minute which can be tolerated in the body, depend very, very much on the quality of the radiation emitted. The unit of radioactivity used is the curie which is a rate of disintegration of atoms, actually 2.2 million million per minute. One gram of radium distintegrates at this rate. Tritium, of course, is a rather extraordinarily harmless isotope from the point of view of fallout and radiation hazards, but radium, unfortunately, is about the most harmful isotope known. As a result, our experiences with this first radioactivity to find any practical use have given us the impression that radioactivity in general is inclined to be rather more lethal than probably is justified. It certainly would be difficult to discover among the 800 radioactive species now known, one more dangerous than this first natural radioactive isotope, the widely used radium. In all cases, it is necessary to understand clearly the nature of the radiations emitted by the radioactive materials involved and not to assume that a curie of one isotope is as dangerous as a curie of any other.

One bomb of the size used on Hiroshima liberates 2.2 pounds of fission products. Although 2.2 pounds of radium would have an activity of 1,000 curies, fission products decay very rapildy and contain at first an enormously greater amount of radioactivity. About 60 different redioactive species are present among the fission products most of which are radioactive though certain fractions are not. At 1 minute after the bomb is fired, the activity corresponds to nearly a million million curies, or about a million tons, of radium. However, at the end of 1 hour, the activity is reduced to that of 6,000 tons of radium; after 1 day to 130; after 1 week to 13; and so on until the end of the year the activity is equivalent to one-tenth of a ton of radium. This 20-kiloton bomb therefore generates an enormous amount of radioactivity. Any fission weapon will generate radioactivity in strict proportion to its kiloton yield, or to the aggregate blast and thermal effects. We neglect for the moment any effects of radioactivity induced in the surroundings by the neutrons emitted in the explosion itself. Neutrons travel only a few hundred yards in air before being absorbed to form a long-lived isotope of carbon which is quite harmless. It seems clear, therefore, that the neutron radiation will not constitute any serious hazard to the civilian population. The fission products themselves, however, do.

As pointed out before, the radioactivity of the fission products decreases rapidly with time—the activity being about in proportion to the reciprocal of the 6/5ths power of the time elapsed since the bomb burst. This extremely rapid rate of decay has a very important bearing on civilian defense. It indicates that a few hours waiting in cellars and foxholes might provide effective protection for the bulk of the population. To illustrate, a fallout which in 1 hour is giving 400 roentgen units of radiation per hour to a human body will at the end of 1 day give only nine of these units; at the end of 2 days, only 4; at the end of the week, it is reduced to about 1. For example an ordinary dental fluoroscope may correspond to 10 roentgens locally. An X-ray would be about 0.1 roentgen. We thus see that the decrease in the first few hours is enormous and the importance of protecting the population against exposure to the initial radioactivity is very great indeed. It is suggested, therefore, that a principal measure for protection of the populace against fallout is reduction of opportunity of early exposure. The bulk of the fission products are not gaseous materials but consist of dust formed from the explosion. Radioactive atoms themselves reside on and in particles found in the air and formed by the explosion. The material can be removed with air filters and there seems to be no reasonwhatsoever that a good cellar will not be excellent protection. Tests of various ordinary structures to determine the protection they afford against general fission produce fallout radioactivity would be very useful. We know from the laboratory measurements on the characteristics of the radiations emitted by the fission products that ordinary structures should prove to be quite effective.

Following the cooling period, the populace could stay behind shelters as much as possible. Certain measures could be taken to remove radioactive material and reduce the general hazard, according to directions of the Federal Civil Defense Administration. It would seem that simple measures are likely to be effective. Sufficient radioactivity of long lifetime is contained in the fission products so that the waiting process will not be effective for more than the first day or so. The longer lived material must either be removed or covered. As a rough rule, about a foot of earth is good shielding, 2 feet of earth is excellent shielding, and water at about 3 times these thicknesses, that is, 1 yard of water being equivalent to 1 foot of earth is effective also. In other words, a shovel properly used could

save a man's life. If no readymade cellars were available, he could merely dig a hole and crawl in it and stay there for the first few hours. Even with a broom he might sweep the contamination from an area large enough to give him protection. A fire hose probably could be used for a similar purpose as well. A host of simple and practical measures suggest themselves for decontamination, but tests should be carried out to prove their effectiveness. It is probable that, in aggregate, the shielding and decontamination procedures would protect the populace very effectively against most fallout conditions. All of these points are well known, of course, to the Federal Civil Defense Administration but are reiterated because of their general importance.

The most frightening and insidious characteristic of radioactivity is that it is unobservable except with instruments. Of course, in extremely high levels the physiological effects do manifest themselves rather quickly and in a sense this type of observation might be used, but these effects are so insensitive to radiation and occur so slowly, that there is certainly no likelihood of their being of any use whatsoever in the problem of protecting the population. The alternative seems to be that radiation detection instruments be used. One possibility is that cities customarily equip a certain number of their civilian employees such as the police and firemen with radiation detection instruments. The water filtration stations might possess them and routinely test the water supply. The schools might also be useful monitor stations particularly in the country. The second general point, of course, is that some education of the public on these matters is called for. It would be helpful if people realized that radiation is not overpowering or invincible. Demonstrations of the power of a shovel, a broom, and a fire hose would be most valuable.

The fallout hazard itself is dependent on the conditions under which the bombs are fired. It is obvious that a bomb which is fired on the surface of the ground draws up into the fireball and carries up into the stem and cloud thousands and possibly millions of tons of matter. This material, of course, becomes thoroughly contaminated with the radioactive fission products and constitutes a mechanism by which the radioactivity is precipitated more rapidly and more locally and, therefore, at higher concentrations than it would be from an air burst. The Hiroshima and Nagasaki bombs both were air bursts and there was very little radioactive contamination in either of these cities. This result would seem to be a general one. Of course, the larger thermonuclear weapons have larger fireballs and consequently would have to be fired at a higher altitude in order to avoid touching the ground. But there seems no reason to doubt that for these weapons the same principle does apply. It is perhaps conceivable that very adverse weather conditions might lead to some concentration of the radioactivity by the rainfall occurring from or falling through the bomb cloud. The bomb mushrooms rise to such great heights, however, so rapidly that that seems to be not a very serious hazard, at least not early so serious as the type of hazard which surface fired bombs create.

It is clear that the danger will depend to a certain extent on the nature of the surface on which the bomb is fired. Even the composition of the soil would affect the rapidity with which the falling material condenses and precipitates, and the efficiency with which the radioactive products are removed from the air. Water, of course, differs from soil in this regard. It would be in the interests of civilian defense if experiments to test the efficacy of various measures, of washing streets and buildings free of radioactivity precipitated upon them by bombs fired under various conditions, could be made. Many of these data already are available. It seems likely, for example, that a bomb fired on limestone or coral should differ greatly in the radiological hazard it constitutes from one fired on desert sand. The heat of the bomb would dissociate the limestone or coral, forming lime which will be slaked by the atmosphere during its precipitation or after settling out on the surface of a building or street. This probably means that the particles will be quite adhesive. A sand shot, on the other hand, most certainly will make nonadhesive particles which should be easily removed. A water shot probably would be somewhat intermediate in this respect, a portion of the radioactivity being removable easily and a portion being quite adhesive. Studies of this type certainly would be helpful.

Air bursts precipitate their radioactive products over a wide area. Because the material available for the formation of particulate matter is limited to that in the bomb and whatever dust may be present in the air, the particles in general are inclined to be smaller and to have been formed at a higher altitude. This results in a very slow rate of precipitation, at least for the smaller particles and, most fortunately, keeps the radioactive material suspended in the atmosphere during

the crucial first day or so, so that most of the radioactivity is dissipated in the atmosphere. In other words, air bursts are relatively harmless, radiologically speaking, as far as local contamination is concerned and as far as the net contamination of the earth by short-lived materials. They do, however, lead to a general widespread dissemination of long-lived radioactive fission products. These materials, of course, do not decay appreciably in the air and are precipitated eventually. It is easy to calculate that the widespread dissemination from the weapons fired to date should be detectable any place on earth although the intensity of radioactivity is so feeble that only the most sensitive instruments and procedures could be expected to reveal it. This is true. The amounts of radioactivity from the bombs found in ordinary matter are small as compared to the radioactivities naturally present in the earth and living objects. It is restricted to the surface of the earth and is found in those places one might expect to find dust falling out of the air and with the chemical properties of the fission products, that is, those of the rare earth elements and the alkaline earth elements. There are, of course, some other elements particularly, the cesium isotope–137. The amount of radioactivity is so small it can be found most easily under conditions where the opportunities for dilution have been least. For example, detection in sea water is difficult in that the material so dilutes that considerable concentration is first necessary. From this type of measurement, however, we do understand something of the long-range dissemination processes which are involved in the fallout from the high levels of the atmosphere of the fine particulate matter resulting from air bursts. We can see that the curative processes by which the earth covers over this dust and incorporates it into the soil and the depths of the sea are such that it is not likely that this type of hazard would be one which the Federal Civil Defense Administration should concern itself with at this time. Generally speaking, there is no immediate hazard to the civilian population in this type of fallout. Our problem is very likely restricted to the type of fallout which results from firing bombs near the surface of the earth.

The likelihood of bombs being fired in this way is, of course, a question which can only be answered by military experts. One does know, however, that certain conditions would certainly produce surface explosions. A clandestine weapon most probably would be fired from the surface. It seems not unlikely, however, that many of the bombs, a large fraction of them, will be fired in the air for the reason that certain blast and thermal effects are larger and likely to result in a wider area of damage under these conditions. A bomb fired very close to the surface certainly has restricted area of blast and thermal damage. In other words, the fallout problem might be minimized by the enemy's attempt to maximize the blast and thermal effects. It seems unlikely that one would be able to predict the probabilities in advance, but certainly there is a likelihood that fallout will be a serious Federal civil-defense problem.

In order to judge more quantitatively the effect of a given fallout we calculate the external whole body gamma radiation as the general exposure a person would receive who did nothing about protecting himself from fallout and who is exposed to the fission products from a 1-kiloton bomb distributed uniformly over an area of 1 square mile. This is about as high concentration of fission products as one would anticipate finding, except under very adverse conditions since it would mean, for example, that for a 20-kiloton bomb, all the fission products would have to be precipitated in a circle with a 2½-mile radius. If the fission products from such a hypothetical bomb were 1 day old before the fallout occurred, and the individual spent the rest of his life in the same spot taking no protective measures, he would receive 470 roentgen units—a sublethal dose which would kill half of those exposed. If however, he came into the contaminated area at the end of 10 days, he would receive 187 and at the end of 100 days, only 74. One sees, therefore, that a populace which does nothing to protect itself from a fallout might suffer very seriously but it is equally clear that all sorts of palliative measures can be taken—digging a foxhole would be an excellent one. The fresh earth piled around the edge would cover the contamination in the immediate vicinity and also constitute shielding against the radiation. Other measures would be effective. These, as I have said before, might be as humble as retiring to your cellar or even behind a concrete wall, or between a pair of buildings, or inside a brick house, etc. All such measures will greatly reduce the exposure. It would be important, however, that people have available instruments to guide them in these moves and that they have some preliminary education and understanding. The Atomic Energy Commission is willing to cooperate with the Federal Civil Defense Administration in these respects. It is to be hoped that the earnest efforts of your group will result in the strengthening of the defense

capabilities of our Nation. There is no doubt that ignorance is a principal weakness and the discussion and consideration of these macabre factors and possibilities will in itself strengthen us.

Mr. STRAUSS. I should also like to make a matter of record that the Atomic Energy Commission unanimously favored the publication of the facts on fallout as soon as these facts were established by meticulously careful evaluation of all the data accumulated during the tests in the Pacific in the spring of 1954.

Our philosophy on this point was expressed on one of the interagency staff papers on the study of proposed changes in the national policy on dispersal. Referring to the need to inform the American public fully about the dangers from fallout, this statement was made [reading]:

> It is believed that if the citizens of this country are provided the necessary facts, they will react calmly and will respond with support of the programs to counteract the threat. To keep the information from them would be to flaunt an unthinkable disregard for the moral obligations of an elected government to its people.

That is the end of the quotation, Mr. Chairman.

However, as against the clear obligation to inform the public of the dangers of fallout, in order that they may know what measures they should take and could take to protect themselves in the event of atomic attack against our country, there was an equal obligation that the publication of the Commission's statement on fallout should not be harmful to our national interests in respect of our foreign relations.

By the end of November the Commission staff had prepared a statement on fallout which was suitable in our opinion at that time for publication. It was considered, however, in the judgment of heads of other agencies of the Government with whom I consulted, that publication of the Commission's statement might then adversely affect certain major international decisions.

In early February we concluded the publication of the statement need no longer be deferred and accordingly we coordinated the ninth and final draft of the statement with the interested departments and agencies and with the approval of the President, the statement with minor editorial revision was released on February 15.

Mr. Chairman, in concluding I would like permission to insert in the record at this point my unclassified statement made in executive session today on AEC-FCDA relationships.

Representative KILDAY. Without objection it will be included in the record.

Mr. STRAUSS. Thank you, sir. That is the end of my prepared statement.

(The statement referred to follows:)

RECORD OF ATOMIC ENERGY COMMISSION RELATIONSHIP WITH FCDA

It has been the long-standing policy of the Atomic Energy Commission to assist the national civil defense effort in all ways consistent with AEC's functions and responsibilities under the Atomic Energy Act. The operations of the Commission in several ways have been carried on to put this policy into effect.

A major element of the AEC assistance has been provision of scientific and technical information useful for civil defense to the appropriate Federal agency—the Federal Civil Defense Administration since passage of the Civil Defense Act of 1950; previously, the Office of Civil Defense of the National Security Resources Board. This concept was expressed at the December 1950 hearings of the Sub-

committee on Civil Defense of the Senate Armed Services Committee considering the bill subsequently enacted as Public Law 920 (known as the Civil Defense Act of 1950), as well as at the hearings held earlier that year before the Joint Committee on Atomic Energy on the matter of civil defense against atomic attack.

Our Advisory Committee for Biology and Medicine at one of its early meetings expressed an interest in the relationship of AEC to the civil-defense problem—an interest which has continued undiminished to the present moment. At the 14th meeting held in February 1949, the Advisory Committee recommended to the General Manager that the AEC "select and appoint a staff member to give his entire attention to collecting the necessary information and to studying the relations and activities of the Atomic Energy Commission in relation to agencies concerned with defense of the civilian population and the training of appropriate personnel to handle disasters due to atomic warfare."

Subsequently, early in 1950, the AEC recognized that a mechanism was needed not only to provide continuous liaison with Federal civil-defense authorities but to anticipate their needs and to transmit to them data vital to their program, and the Civil Defense Liaison Branch was established in the Division of Biology and Medicine to perform these functions.

Many of the scientific and technical data so furnished for civil defense use are necessarily in the category of restricted data as defined by the Atomic Energy Act, inasmuch as they stem from atomic weapon test operations. Much material, both classified and unclassified, in the fields of medical and biological research, radiological monitoring, radiation instrumentation, and atomic weapon effects has been so transmitted.

Transmittals of classified data have been made in accordance with all pertinent AEC security regulations regarding personnel clearances, receipt and custody of classified information, et cetera.

In 1951, the advent of an extensive atomic weapon effects program at Operation Greenhouse made it obvious that many of the resultant data would be of use to the Federal Civil Defense Administration. By mutual agreement of the Atomic Energy Commission, Department of Defense, and the Federal Civil Defense Administration, it was determined that the following standard categories of atomic test information should be made available to the FCDA.

1. Effects on structures.
2. Effects on materiel and equipment.
3. Biological effects.
4. Radiation detection instruments and techniques.
5. Cratering and ground shock.
6. Particle fallout patterns.
7. General shock, blast, radiation, and thermal effects.
8. Such other data as may be jointly determined feasible.

The restricted data furnished by the Atomic Energy Commission to the Federal Civil Defense Administration are principally atomic weapons effects information in these categories and are in the form of weapons test (WT) reports. Under a working agreement with the Department of Defense all such reports are reviewed by the Armed Forces special weapons project and the Atomic Energy Commission and agreement regarding classified transmittal is reached prior to release to the Federal Civil Defense Administration. WT reports and other data of interest to FCDA not containing restricted data are transmitted by AFSWP to FCDA without prior AEC review. The AEC is informed of such transmittal. A recapitulation of the status of transmittal of WT reports to FCDA as of March 16, 1955, is as follows:

Operation Ranger (January–February 1951)	2
Operation Greenhouse (April–May 1951)	56
Operation Buster/Jangle (October–November 1951)	28
Operation Tumbler/Snapper (April–June 1952)	28
Operation Ivy (November 1952)	13
Operation Upshot/Knothole (March–June 1953)	65
Operation Castle (March–May 1954)	9
Total	201
Non-RD (not reviewed by AEC)	47
Total	248

A listing, by title, of the WT reports containing restricted data transmitted to FCDA under provisions of the Atomic Energy Act after joint AEC and DOD review is attached to this statement. These total 201 reports.

Certain deletions of information of weapons development or diagnostic nature, as opposed to weapons effects information, have been made in a small percentage of the WT reports transmitted to FCDA, in accordance with interagency understandings.

It has been emphasized by the Commission in its continuing day-to-day relationship with FCDA that information in the classified reports which FCDA deems necessary for public dissemination should be extracted, rewritten in suitable form for maximum usefulness to the public, and submitted to AEC for declassification action.

To make effective use of the classified information provided, FCDA has requested extensive clearance of their personnel by the AEC. The procedure in accomplishing this is a simple one. FCDA requests initiation of AEC clearance by writing to the Civil Defense Liaison Branch, AEC, stating the need of the individual for access to restricted data. This request is reviewed by this Branch and upon determination of appropriate justification of "need to know," is endorsed to Washington Area Security Operations, which office then initiates the appropriate clearance action.

Following are statistics concerning personnel clearance actions taken by the AEC on behalf of the FCDA:

The AEC has granted 404 clearances for access to restricted data to persons for participation in the FCDA program. Of these, 245 are currently active as Q clearances. In addition, the AEC is now processing 62 clearances requested by FCDA. Of the 245 active clearances, 107 are held by FCDA employees and the remaining 138 cover consultants, members of boards and committees, State civil defense officials, and Federal officials cooperating in the FCDA atomic test program. The FCDA and AEC have been in agreement as to what FCDA sponsored personnel should be processed for clearance for access to restricted data.

About 2 months are normally required to obtain a full background investigation, to evaluate the reports and to grant final Q clearance. However, of the 404 clearances referred to above, 144 were granted on the basis of existing investigations conducted for other purposes. In such cases clearances can usually be granted in about 2 weeks. Moreover, in September 1953, the AEC granted 74 emergency clearances to FCDA employees and State officials to enable them to attend a showing of a film classified as secret—restricted data. Procedures for granting clearances of this character have been changed under the 1954 act.

In addition to the providing of scientific and technical information for civil defense use, the AEC has actively assisted the civil-defense effort in several other areas on a continuing basis over a number of years. For instance:

1. Pending establishment of civil defense organizations with definite assigned functions for radiological defense, the Commission acted in1949 to establish emergency radiation monitoring teams in 18 locations throughout the Unted States, to operate under the jurisdiction of 5 AEC operations offices. These teams were composed of AEC and contractor personnel experienced in radiation detection work at atomic energy installations, and stood ready to monitor any radioactivity resulting from enemy attack or disaster, using radiation detection instruments stockpiled by the Commission.

In the period since establishing this emergency monitoring network, civil defense organization and training have made appreciable strides forward, with the result that on January 4, 1954, after consultation with the Federal Civil Defense Administration, the AEC teams were relieved of responsibility for civil defense radiological monitoring operations. AEC continues to serve as scientific and technical adviser to FCDA and to State and local civil defense bodies in this area and wherever else AEC experience and competence apply.

2. Publication on August 12, 1950, of the Effects of Atomic Weapons. This handbook, jointly sponsored by AEC and the Department of Defense, is the authoritative compendium of unclassified atomic weapon effects information. It is now under revision to include data gathered in tests and otherwise.

3. In 1950, the AEC conducted under joint sponsorship with the National Security Resources Board civil defense training courses, as follows:

(*a*) A 5-week training course for instructors in radiological monitoring at 5 locations, with 83 persons representing 39 States, Alaska, Hawaii, Puerto Rico, and the District of Columbia participating.

(*b*) A 1-week instructor training course on the medical aspects of atomic warfare, given at 7 AEC and contractor installations. One hundred fifty-seven physicians representing 31 States, Alaska, Hawaii, Puerto Rico, and the District of Columbia, plus observers from the United Kingdom and Canada attended.

(c) A 1-week course for nurses in the medical aspects of atomic warfare, attended later in the year by 70 nurses.

4. Beginning with the fall of 1951 continental test operations, the FCDA has participated in AEC test operations to an increasing degree. This participation has involved FCDA staff observers and operating personnel at both continental and overseas test operations, execution of two so-called open shots observed by local, State, and Federal civil defense officials and reported by the Nation's news media. The AEC invited observers and reporters at the request of FCDA which desired these events in order to stimulate civil defense participation nationally and locally. In addition, substantial participation in field civil effects experimentation at the Nevada test site has been carried on by FCDA.

FCDA participation in operation teapot now underway at Nevada test site (NTS) involves a third open shot which will include civil defense demonstration and training exercises as well as widespread media and civil defense observer and reporter participation. Also, FCDA is carrying out its largest field experimentation program to date at the current tests.

Such technical participation in AEC weapons tests by FCDA, and other Federal and private organizations under FCDA sponsorship, is planned for and coordinated through the medium of two AEC-originated interagency committees—the Biomedical Test Planning and Screening Committee and the Structures Test Planning and Screening Committee. FCDA has had membership on both committees since their inception.

5. At the initial request of the National Security Resources Board, AEC late in 1950 began lending radiation detection instruments to State and local agencies for civil-defense training. This loan program was shortly thereafter broadened to include radioactive isotopes for civil-defense training and instrument calibration. The program was continued in collaboration with the FCDA. To date, 64 instrument loans have been made to 24 States, Hawaii and several cities; 57 loans of isotopes have been made to 26 States, the District of Columbia, several cities, and Federal agencies. In the last year or so, there have been relatively few requests for instrument loans, due to the direct procurement of instruments by the FCDA and State and local civil-defense organizations. Radioisotopes are still requested from time to time. Sources, principally Cobalt–60, are available for civil-defense instrument calibration, and for training use.

6. Continuous technical advice and information in the field of civil-defense radiological instrumentation have been provided FCDA. The AEC has worked closely with FCDA in assisting in the development and production of instruments appropriate for civil defense use and has cooperated in the testing and evaluation of instruments as requested by FCDA.

7. Scientific and technical conferences and symposia, as well as informal meetings of the respective staffs of FCDA and the AEC are held on a continuing basis, affording frequent opportunity for interagency consultations, both formal and informal. The AEC Commissioners and staff members have participated, at FCDA invitation, on a number of occasions in national civil defense conferences, notably the White House Conferences of Mayors, and the governors' conferences. In cooperation with the United States Weather Bureau, a number of briefings and conferences have been arranged to consider the problem of radioactive fallout and means of predicting, measuring, and combating this hazard.

In short, the Atomic Energy Commission has made, and continues to make information and training pertinent to civil defense activities available to the Federal civil defense authorities. The AEC has processed expeditiously FCDA requests for clearance of personnel to receive restricted data. To those cleared for restricted data, the AEC has provided more than 200 classified weapons test reports in 8 categories applying to civil defense planning and operations. As FCDA has brought forward material with request for declassification, the AEC has processed the requests through its classification system.

To assist in gathering more information on civil effects of nuclear weapons, the AEC has worked closely with the FCDA in testing programs over the past 4 years. In the early days of the civil-defense program the AEC carried on extensive training courses, made available instruments for emergency use, and provided radiation survey teams from its operations offices for the same purpose.

We are continuing such cooperation and welcome every opportunity to contribute to the development of a sound national civil defense program.

Weapons test reports (AEC restricted data) furnished FCDA

RANGER

Number	*Title*
WT–201	Program Reports—Gross Weapons Measurements (Volume 4)
WT–204	Program Reports—Operational (Volume 5)

GREENHOUSE

WT–4	Fall-Out Phenomenology
WT–6	(Animal) Control Studies Performed in U. S. and Eniwetok, Parts 7, 8, 9
WT–8	Blast Injury in Foxholes
WT–9	Thermal-Radiation Injury
WT–10	Instrumentation for Structures Program, Part 2
WT–12	Protective Clothing and Clothing and Personnel Decontamination
WT–13	Miscellaneous Studies of Dosimeters
WT–15	Exposure Containers for the Biomedical Program
WT–16	Pathology of Radiation Injury, Parts 1, 2, and 3
WT–19	Evaluation of Filter Material
WT–20	Blast Measurements, Part II, Free-Air Peak-Pressure Measurements
WT–21	Scientific Director's Report of Atomic Weapon Tests at Eniwetok, 1951, Evaluation of Program 2
WT–22	Mortality Rate as a Function of Distance, Parts I, II, and III
WT–23 (Ref)	U. S. Navy Structures, Appendices E to J
WT–25 (Ref)	U. S. Navy Structures, Appendix L, Postshot Photographs
WT–26	Interpretation of Survey Meter Data
WT–27	Contamination-Decontamination Studies
WT–29	U. S. Air Force Structures
WT–30 (Ref)	U. S. Air Force Structures, Appendix A, Section 2; Appendices C and I
WT–35 (Ref)	U. S. Air Force Structures, Appendix F, Photography
WT–42	Evaluation of Collective-Protector Equipment
WT–43	Experimental (Biological) Data Obtained in the Field, Parts I, II and III
WT–44 (Ref)	Natural Frequencies of Structures and Stimascope Measurements
WT–53	Blast Measurements, Part IV, Pressure-Time Measurements in the Mach Region
WT–54	Blast Measurements, Part II, Free-air Peak Pressure Measurements Section 1
WT–55	Blast Measurements, Part III, Pressure Near Ground Level, Sections 1 and 2
WT–56 (Ref)	U. S. Army Structures, Appendix 10
WT–58	Blast Measurements, Part III, Pressure Near Ground Level, Sections 4 and 5
WT–63	Evaluation of Ground Radiac
WT–64	Blast Measurements—Part I—Summary Report
WT–69	Blast Measurements—Part VI—Ground-Shock Measurements
WT–70	The Effect of Thermal Radiation on Material
WT–71	Atmospheric Conductivity
WT–76	Delayed Gamma-Ray Measurements, Part I, Gamma-Ray Spectrum Measurements
WT–78	Blast Measurements—Part III—Pressure Near Ground Level, Section 3
WT–81	Delayed Gamma-Ray Measurements, Part III, Film Dosimeter Measurements
WT–82 (Ref)	U. S. Air Force Structures, Appendix G, Transient Records, Section I, Pressures and Displacements
WT–83 (Ref)	U. S. Air Force Structures, Appendix G, Transient Records, Section II, Strains and Accelerations
WT–84 (Ref)	U. S. Air Force Structures, Appendix H, Reduction of Transient Data from the Air Forces Structures
WT–87	U. S. Air Force Structures, Blast Loading and Response of Structures, Section I, Blast Loading

Number	*Title*
WT–88	U. S. Air Force Structures, Appendix I, Blast Loading and Response of Structures, Section II, Structural Response
WT–89	Radiological Safety
WT–91	U. S. Navy Structures
WT–93 (Ref)	U. S. Army Structures, Appendices 4 and 5
WT–105	Measurements of Surface-Air Movements Associated with Atomic Blasts
WT–107 (Ref)	Delayed Gamma-Ray Measurements, Part I, Gamma-Ray Spectrum Measurements
WT–109	Blast Measurements, Part VI, Ground-Shock Measurements, Section 2

GREENHOUSE INTERIM REPORTS

GIR–3.0	The Test of Structures, Annex 3.0
GIR–3.1–I	Army Structures Test, Annex 3.1, Volume I
GIR–3.1–II	Army Structures Test, Annex 3.1, Volume II
GIR–3.1–III	Army Structures Test, Annex 3.1, Volume III
GIR–3.2	Navy Structures Test, Annex 3.2
GIR–3.3–I	Air Force Structures Test, Annex 3.3, Volume I
GIR–3.3–II	Air Force Structures Test, Annex 3.3, Volume II
GIR–3.3–III	Air Force Structures Test, Annex 3.3, Volume III
GIR–3.3–IV	Air Force Structures Test, Annex 3.3, Volume IV

BUSTER/JANGLE

WT–301	Some Measurements of Terrain Effects on Blast Waves
WT–302	Attenuation of Earth Pressures Induced by Air Blast
WT–309	Thermal and Blast Effects on Idealized Forest Fuels
WT–310	Effects of Geometry on Flash Thermal Damage
WT–311	Effect of Thermal Radiation on Materials
WT–312	Protective Value & Ignition Hazards of Textile Material Exposed to Thermal Radiation
WT–315	Radiation Dosimetry
WT–316	Thermal Effects on Animals (Rats)
WT–317	Evaluation of Dosimetric Materials
WT–356	The Measurement of Gamma-Ray Intensity VS Time
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UKP–15	Tests on the Response of Wall and Roof Panels and the Transmission of Load to Supporting Structures
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UKP–23	The Blast and Thermal Effects of an Atomic Bomb on Typical Tactical Communication Systems
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WT–774	Incendiary Effects on Building and Interior Kindling Fuels
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WT–793	Biological Effectiveness of Ionizing Radiation within Shelters
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WT–798	Effects of Overpressures in Group Shelters on Animals and Dummies
WT–803	Measurement of Fast Neutrons by Effects on Semiconductors
WT–811	Distribution and Characteristics of Fall-Out at Distances Greater than 10 Miles from Ground Zero, March and April 1953
WT–812	Environmental and Biological Fate of Fall-Out from Nuclear Detonations in Areas Adjacent to the Nevada Proving Grounds
WR–814	Effective Energy of Residual Gamma Radiation
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ITR–901	Blast Effects on Miscellaneous Structures
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ITR–907	Instrumentation for Projects 1.2a, 1.3, and 1.7
ITR–910	Water Wave Measurements
ITR–913	Gamma Rate vs Time
ITR–915	Distribution and Intensity of Fall-Out
ITR–916	Fall-Out Studies
ITR–920	Crater Survey
ITR–933	Cloud Photography

Representative KILDAY. First I would like to direct a question or two to Governor Peterson.

Referring back to your testimony before the Senate Committee on Armed Services, I would like to read it, so we can have your comments on it, in the light of the statement you have given us today. You said [reading]:

> Mr. Chairman, if I might, that without any implied criticism on my part or any discussion of the merits of the security or of the classification which was placed on fallout data, without passing any judgment on it here in this comment, I might say that this classification made it extremely difficult for us to work in the area of preparation to take effective steps to meet the threat of fallout.
>
> For instance, we simply could not reveal that data to the Bureau of Public Roads. It is classified. You cannot discuss it.

Senator Kefauver stated [reading]:

> I can see that would be a very big detriment to the proceeding.

Then you proposed, Governor [reading]:

> Yes; and even in my own organization, in our own organization I think I should say in justice to the people who are on my staff that we could not discuss the fallout problem or fallout data with even the people in our agency who were cleared to accept secret because they did not have Q clearance. Obviously they were not under law entitled to this information so we had a very difficult situation in which one man in the shop working side by side with another man would have this information while the other fellow could not, and it made a trying situation. When we lost a number of stenographers and clerks in our move who had had Q clearance, we found it difficult to get people Q cleared quickly enough to have them join in our work.

As to the situation which then existed and the situation now, Governor——

Mr. PETERSON. Did you phrase that as a question, Mr. Chairman?

Representative KILDAY. Yes, sir. I stated when I was beginning to read, that I wanted your comment on your testimony at that time in comparison to the statement you have given us today.

Mr. PETERSON. There are several considerations involved in this matter. There is the broad necessity on the part of Civil Defense

to make available to the public, and particularly to governors and mayors who have the primary responsibility for civil defense, as complete information as we can about all weapons effects. In that area, of course, as I indicated in my statement today, I constantly desire to have made available to those officials all possible information consistent with the security requirements of our Nation, because all of us want to handle this information in such a way as not to give any benefit to the enemy.

In that area I am constantly trying to get information declassified and made available to those responsible officials.

There are one or two other aspects of this problem:

It is true that when this information first was made available to us on a classified basis last summer that we did not have all of the people in our agency Q cleared and so we did have a situation where with a new problem of tremendous magnitude, as everyone I am sure understands, we found it difficult to do our work as rapidly as we wanted to and as thoroughly as we wanted to with the number of people who were Q cleared.

I should say I am not conscious of any time when the Atomic Energy Commission has not been very cooperative in helping us get people Q cleared. There is no complaint on out part about the Q clearance process excepting that is takes a considerable amount of time, which is understandable.

So that we did have that difficulty. Then in connection with our move, in which we moved our national headquarters from here to Battle Creek, we lost some of our stenographers and clerks who did have Q clearance and we had the problem of replacing them.

That is purely a coincidental situation. We have replaced them. Today, we have the replacement Q cleared and that problem no longer exists.

Representative KILDAY. Do you have an adequate number now Q cleared?

Mr. PETERSON. I would answer that this way: that we either do have or are in the process of getting an adequate number Q cleared.

Representative KILDAY. Then the difficulty at that time was—because of the loss of Q cleared persons who did not move with you—or the time necessary to secure Q clearance. and not because the AEC did not clear the people you requested.

Mr. PETERSON. That is correct, sir.

Representative KILDAY. And at the present time you feel that with those cleared and those pending you will have an adequate number?

Mr. PETERSON. We will have an adequate number of people internally in our agency who will be prepared to handle information of this kind. That relates, of course, to what I think may be also the secondary problem here, but nevertheless a very important problem.

Representative KILDAY. Specifically with respect to the area of our jurisdiction, do you have any amendment to propose to the Atomic Energy Act or any discussion of any provision of the Atomic Energy Act in connection with security and release of information that you feel should be changed and upon which we could take action?

Mr. PETERSON. I am not prepared today to make a specific recommendation. I should only suggest that if in the wisdom of the committee it should be found possible in the future to eliminate the

necessity for the restricted-data provision of the act so that people who do have top secret clearance could have this information, it would be helpful.

However, if that in anywise would jeopardize the security of our country, I certainly wouldn't want it done and am certain that the committee is better qualified to make a judgment in that area than I am, at least than I am today, sir.

Representative KILDAY. On the fallout question, how long before the information was released by the Atomic Energy Commission on the effects of the fallout, pattern and what not, had you received that information on a classified basis?

Mr. PETERSON. Well, may I answer the question this way, sir: We did have observers at the tests, the tests that were conducted in the Pacific in March 1954, as I believe we have had them in every test that has been conducted by the Atomic Energy Commission.

Of course, we received some broad indications of this problem, but they were not meaningful to us or to anyone else in fact, because it took the scientists a considerable period of time to collect this information, to collate it, and analyze it, interpret it and get it in shape to make it available to others.

The admiral's record here indicates that in May there was one rather preliminary meeting in which this matter was discussed broadly and then in the last few days of June and, of course, more particularly and on a formal basis on the 8th of July, we received complete information with respect to fallout.

Representative KILDAY. The 8th of July?

Mr. PETERSON. July 8.

Representative KILDAY. The release by the Commission was the following February?

Mr. PETERSON. That is correct.

Representative KILDAY. Now, on July 8 did you receive substantially the same information received in February?

Mr. PETERSON. Yes, I think that as we all learned more in those intervening months there were some refinements, but I think basically we had all of the information on July 8, and we proceeded from that time on, Mr. Chairman, within the limits of the security classification to make that information available to the American people.

I recall in September I spoke to the National Association of the Civil Defense State Directors in as much detail as I could within the bounds of the security requirements on this subject.

Representative KILDAY. After July 8 did you proceed to formulate the changes in your plans for civil defense which were made necessary by this information?

Mr. PETERSON. Yes.

Representative Kilday. And you made plans even though you could not reveal the reasons therefor to the public generally?

Mr. PETERSON. Indeed we did, sir. We did so immediately. That is a continuing process but we took full advantage of this information at that time.

Representative KILDAY. You were not handicapped by the fact it was not given to the public generally by the Commission until February?

Mr. PETERSON. Not internally in my own organization. We were not handicapped at all. We were able to go on with our work with

the exception as indicated in our earlier conversations with respect to the loss of some people and the necessity for the time requirement in making Q clearances.

However, we were handicapped in this respect: The statement I make now is no criticism whatsoever of the Atomic Energy Commission. We were handicapped because in civil defense our law provides that primary responsibility rests with the States and localities and we were handicapped in the fact that we were not able to make known to those responsible authorities the extent of the fallout problem in terms of the width of the pattern and length, which is highly important for our purposes, as I am certain all members here would recognize.

Neither were we permitted to discuss the dosages. But with those exceptions we went right ahead and discussed this problem with civil defense people and advised them of steps they could take to protect the people and as a matter of fact, advised the public.

Some of you may recall that as early as last summer I was making speeches in which I suggested to the American people that the best protection against the effects of radioactivity was to be found in an old-fashioned Kansas or Nebraska cyclone cellar. I daresay you have some of them of the same type down in Texas. However, I don't believe that the public fully understood what we were talking about.

Representative KILDAY. I want to call your attention again to a portion of your testimony before Senator Kefauver's subcommittee, read to you a moment ago [reading]:

> I might say that this classification made it extremely difficult for us to work in the area of preparation to take effective steps to meet the threat of fallout.

Mr. PETERSON. Yes, I am glad you called my attention to that. That referred to the matter of delegations to other elements of the Government. We have made 26 specific delegations under the terms of our law, with the approval of the President, to 6 departments of the Government.

Representative KILDAY. I think I should read the first sentence of the following paragraph in justice to you, Governor [reading]:

> For instance, we simply could not reveal that data to the Bureau of Public Roads.

Is that the manner in which you would qualify the general statement, that it was only in the area of delegation and not within your own agency?

Mr. PETERSON. There was no problem within our own agency other than the ones we have discussed earlier, and those I think are rather insignificant. But we could not, in discussing matters with the Agriculture Department or Health, Education, and Welfare, or Housing and Home Finance or other people with whom we were dealing and making delegations, discuss this classified material.

Representative KILDAY. You had your plans changed in accordance with that information, when the Commission announced in February the results of the fallout?

Mr. PETERSON. Yes, sir.

Representative KILDAY. Did you promptly announce them?

Mr. PETERSON. Our plans are not of such a nature that they could be announced that quickly. As a matter of fact, some of them will be a long time in the formulation. They are very intricate, involve

scientific considerations, require surveys and plans and studies, and a good deal more information than we could get together that rapidly.

Representative KILDAY. One more question, Governor: Do you have anything that is in existence now, any information in existence now, perhaps comparable to the information as to fallout, which has not as yet been declassified and released to the public, anything that is pending that the public should know about or anything which constitutes a hazard to the public which has not been revealed to Civil Defense?

Mr. PETERSON. To the best of my knowledge, there is no such information. The question might appropriately be directed also to Admiral Strauss and to the Secretary of the Department of Defense, but to the best of my knowledge there is no such information.

Representative KILDAY. I will direct the same question to Admiral Strauss.

Mr. STRAUSS. The answer, Mr. Chairman, is that there is no such information. In the statement which we made on February 15 we did take note of the fact that information might subsequently develop in which case the Commission stated that it would be its policy to inform the public.

Representative KILDAY. Are there any questions by other members of the committee?

Representative COLE. Mr. Chairman, along the line of your last question, I was going to raise the same line of inquiry with Governor Peterson because in his formal statement he says:

> I am constantly pressing for the release of more information to the American people with respect to the effects of atomic weapons.

Which immediately creates the impresssion that there are some aspects of the effects of atomic weapons which you feel should be released for public information that have not been released.

That statement does not match up with your response to Mr. Kilday's interrogation to you just now when you say you know of no aspects of weapons effects which should be disclosed but which has not been disclosed.

Mr. PETERSON. I don't find the exact reference here, Mr. Cole.

Representative COLE. At the top of page 2, several lines down. I had underscored it as you went along because I was curious to know if there are any aspects of weapons effects which, from a civil defense standpoint, the public ought to know—and you are their advocate—that has not been disclosed. I think on the other hand if there is nothing that has not been disclosed I think the public is entitled to know that. It seems to me it is quite important to have that made known.

Mr. PETERSON. I would agree with you, sir, and I would not modify the answer that I made previously. Neither do I believe that this sentence is incorrect if borne in mind with the complete context of the statement. It certainly appears, at least from the experience which I have had in 2 years in this field, that new developments are constantly occurring in the field of weapons development and there is constantly the question of when it becomes appropriate to make information regarding these things available to the public. I was stating a general approach to a problem because I believe that in matters which concern the American people and in which the safety of the lives of the people is involved, this should be a general policy.

I think everyone in the administration subscribes to this, and in the Congress, too. The general policy should be to give the people as full information as possible on the very sound democratic principle that the people can be relied upon to do the things that are necessary for their own safety and welfare if they have the basic information.

In that context I think my sentence is correct, sir.

Representative COLE. I am glad to have you clarify that. You mean that you have in the past constantly pressed for revelation of more information and that you will continue to press in the future for revelation of information?

Mr. PETERSON. Yes, sir.

Representative COLE. But at the present time you feel all information with respect to the effect of weapons that the public should know about has been disclosed to the public?

Mr. PETERSON. Yes, sir; and I think it is important that everyone understands that as widely as possible.

Representative COLE. Good.

Now you have indicated some difficulty from the fact that your people who have been cleared for top secret information have not been allowed to discuss restricted data information. How does that come about?

Mr. PETERSON. Well, I used the words "restricted data information" there, and I believe correctly—if not, the admiral can correct me—to mean what we familiarly speak of Q clearance information or information which involves atomic weapons and which in our agency and in the Government generally is only permitted to people on the basis of a need to know. Do I speak correctly, Admiral?

Mr. STRAUSS. Yes, you do.

Mr. PETERSON. We have no desire to violate that and we had no problem in that connection until we hit this fallout problem which by its very nature and the immensity of it created a tremendous problem for us, as I pointed out in my statement, in areas where the problem had never existed before.

Representative COLE. How do your people obtain clearance for top secret information?

Mr. PETERSON. For top secret?

Representative COLE. Yes.

Mr. PETERSON. That clearance is received through the normal channels in the Government. I believe it is correct to say that it is done in the first instance on the basis of information gathered by the people in the Civil Service Commission. When they make their surveys, as I understand it, if they run into no derogatory material in an investigation, they complete it and we act upon that and grant the top secret clearance.

Representative COLE. Do you as administrator of this agency grant clearance to your employees for access to top secret information without some concurrent action by the Secretary of Defense?

Mr. PETERSON. I believe that those names are always submitted to the Secretary of Defense where matters of a defense nature are involved. I don't have my security man with me today, but I believe that is correct, sir.

I was going to say that the FBI does not enter into these things until some derogatory information is found and then there is a full investigation by that agency.

Now if we ask for Q clearance for an individual, there then follows normally a more complete investigation of the individual.

Representative COLE. It is exactly the same as you have just recited to us, the process you use for your own people, the Civil Service Commission——

Mr. PETERSON. That was not true until September of 1954. I think it is true as of the moment; yes, sir. That has been true I think since last September.

Representative COLE. I think you are perhaps correct there.

May I inquire of Admiral Strauss?

Representative KILDAY. Either or both.

Representative COLE. First, Mr. Strauss, I think it would be helpful if you have available and could put into the record the press interview which you had in March of 1954 soon after this matter of fallout at the Bikini tests became a matter of public concern.

Mr. STRAUSS. I would like permission to insert it in the record of this hearing. Do you wish it referred to in any particular part?

Representative COLE. No. Only for the benefit of those who are not familiar with it and to refresh their recollection.

Would you indicate to what extent you disclosed publicly the fact that fallout from atomic or nuclear weapons is a hazard of major proportions?

Mr. STRAUSS. The passage in question, Mr. Cole, is very short and with your permission I would read it into the record.

Representative COLE. Very well.

Mr. STRAUSS (reading):

> Now as to the specific test series—

this is a quotation—

> the first shot has been variously described as "devastating," "out of control," and with other exaggerated and mistaken characterizations. I would not wish to minimize it. It was a very large blast but at no time was the testing out of control. The misapprehension seems to have arisen due to two facts.

I then mentioned yield and came to the second cause of the results of the fallout. When a large explosion occurs on or within a certain distance of the ground, an amount of earth or water or whatever is beneath the center of the explosion is sucked up into the air. The heavy particles fall out quickly, the lighter ones are borne away in the direction of the wind until they too settle out. If the explosion is a nuclear one, many of these particles are radioactive, as are the vaporized parts of the weapon itself. For this reason the Atomic Energy Commission has conducted the tests of its larger weapons away from the mainland so that the fallout would occur in the ocean where it would be quickly dissipated both by dilution and by the rapid decay of most of the radioactivity which is of short duration. The Marshall Islands were selected for the site of the first large-scale tests, Operation Crossroads.

I then described that briefly. It occurred in 1946 and I will skip that part. I then indicated, Mr. Cole, that the Marshallese islanders who were affected by the fallout were at a considerable distance from the point of the shock and this was illustrated by maps which were presented at the time. The date of this statement is March 31, 1954.

Representative COLE. The reason I raised that question is it seems to me that your public disclosure at that time in which you indicated that fallout is a great hazard, coupled with the fact that it was announced about then and disclosed publicly that the Japanese fishermen located some considerable distance from the point of this particular test had been exposed to fallout, would have been sufficient to alert the public without any effort necessarily on the part of Governor Peterson's organization, would have alerted them to the fact that fallout is a very dangerous element of the use of atomic weapons.

So I can attach no great criticism for the failure of the Commission to have made its disclosure earlier than it did in February of 1955.

I do not know what you disclosed in 1955 that any reasonable person couldn't have evaluated was the situation in the disclosure that you made in March of 1954.

Mr. STRAUSS. There were the speeches of Dr. Bugher and Dr. Libby to which I referred in the course of my prepared statement, Mr. Cole. I think the statement in February was a collection, in effect, of the three preceding events to which you have just referred and which I have mentioned, plus information we had learned up until that date.

Representative COLE. It is very, very important to determine the actual effects of radioactivity and fallout upon people, but it takes a great deal of time for that to be determined by our scientists and doctors, that effect is necessary to be known, but the actual, ultimate effect in its varying aspects isn't needed in order to know that the people should be sheltered and protected against that fallout wherever and to the extent it is possible to do so.

I would like to know, Admiral Strauss, what aspect of the effect of atomic weapons you feel should not and could not be disclosed to the public for military or security considerations.

Representative HINSHAW. Mr. Chairman, that might involve the disclosure, the answer to that question.

Representative COLE. Admiral Strauss has been dealing with problems of security longer than you have, and I am certain he is sensitive to that question and if he does not want to answer it, he does not have to answer it, or if he feels the answer can be made in a general way, which I invite him to do, I would like to have him do it.

Mr. STRAUSS. I think it can be answered in that way that will be satisfactory to you, Mr. Cole.

I believe that the only information that is required to be withheld would be information of a detailed nature from which there could be derived educated guesses as to the composition or power of the weapon.

This does not, however, prevent information from reaching the public of the character to inform the public as to the hazards of fallout or their extent.

Representative COLE. I would like to ask Governor Peterson if he feels that the type of detailed information Mr. Strauss just made reference to, is necessary to your purpose in carrying out civil defense.

Mr. PETERSON. We certainly need no detailed information with respect to the composition of weapons. We do, of course, need to know the size of the weapons and effects of weapons, but we wouldn't need any information as to how weapons are constructed or materials that are in those weapons, particularly.

I might say this, though Mr. Cole, I have read quite carefully the statement made by the admiral on March 31, 1954, and while I think in a broad sense your suggestion is correct, that a knowledgeable person could take this and arrive at some conclusions that would be beneficial and there would be some action on his part indicated. I believe the statement is pretty broad and sketchy and I would say that from a civil defense standpoint, because the responsibility for the operational activities in civil defense rests at the local and state level, the fallout pattern and dosages were necessary to the proper performance of civil defense duties.

I could elaborate on that at considerable detail. There are many intricate features of this work and I don't know that it is necessary to do that here.

Again I am not raising any question here as to the necessity for keeping this material classified as long as it was. I have never challenged that at any time. I simply am pointing out that the information in the form that it was made available on February 15 was much more meaningful from a Civil Defense standpoint than any information we had up to that time and was necessary for the people at the city and State level. I don't believe Admiral Strauss would differ with me in that statement.

Mr. STRAUSS. Not at all.

The statement made on March 31, 1954, was made before the tests were completed, and within 48 hours after I had returned, when a minimum amount of data was, in effect, known about them. It was all that we knew at the time. It is interesting in rereading the statement to see that it does comport substantially with what we have since learned.

That is to say there are no glaring inaccuracies in it. There are lacunae of course.

Representative COLE. What is the Scientific Advisory Committee which I understand you created under the auspices of the National Academy of Science to help you in your problem?

Mr. PETERSON. We wrote a letter to Dr. Bronck of the Academy well over a year ago asking for the creation of a committee of scientists who could advise us in the field of civil defense. That committee met once. It has a working party here in Washington. They are attempting to give us advice in relationship to our problems. Our work is intricate, we cut across everything in life because of the nature of our responsibilities, we need information about chemical warfare, about the treatment of radioactive sickness. We need information about the strength of buildings, ability to withstand blast, and we need information about how to evacuate cities and all sorts of traffic considerations, the effects of radioactivity on water and on food, and the stockpiling of foods and other materials.

Our endeavors are as broad as life itself, as you would readily see, because if you destroy 30 or 40 or 50 or 60 or 70 great American cities, if we get them out of the cities we have that many Americans to take care of.

That becomes an intricate subject. We are asking these scientists for every bit of help they can give us. We need more help of the kind.

We have done very little pure research in civil defense.

Representative COLE. How large a group is this committee?

Mr. PETERSON. I have met with the committee once. As I recall there were 25 or 30 scientists available, but as I understand the way in which the National Academy works, we have the total scientific resources of the Nation at our command through these channels.

Representative COLE. Are you gratified or pleased with the help this committee has been able to give to you and your problems?

Mr. PETERSON. I think that the major benefits of this committee's work are to be received in the future.

Representative COLE. I judge from that answer—it is no disparagement of the scientific committee, but apparently it is a fact that up until now the committee has not been of any great help to you?

Mr. PETERSON. No. But you are absolutely right, that is no reflection on the committee. It takes a considerable amount of time for a group of men to get oriented in this field to find out what we are doing, what our problems are, and begin to apply themselves to it.

We have had relatively restricted, I am understating it, too, restricted funds to permit us to operate in these various fields. It has been a rather odd situation in this country. We have spent billions of dollars to develop atomic weapons—I don't know how many billions, the committee would have that figure available. We have spent tremendous amounts of money in research, for all of which I am very glad as a citizen and as Civil Defense Director, I am not criticizing. We have spent billions of dollars for weapons development and through the military but we have spent a very small amount of money to attempt to protect the American people where they live, in the cities which will be the objects of attack, and which cannot be prevented at the time by the military. So we are in the rather anomalous situation that, in the final result, civil defense will have to try to save the lives of people. Please understand me, there is no criticism here of the military, because I think it is doing everything humanly possible to protect the American people against such an attack and I want to have a strong military. But in the final analysis, it appears now that the burden will fall, should the attack come in the next 2 or 3 years, upon civil defense. In this area, this country has made the least degree of preparation. I don't think there is any fault on the part of any one, I don't think you can assess it to the Congress or the executive, I think it is just the fact that it has taken all of us in America this long to appreciate the nature of the problem and necessity for development in this area.

I would like to say this: that I am certain all of you members of this committee read the Prime Minister of England's profound statement in this area and I think that is just another indication of what I am speaking about here.

Representative COLE. Is this scientific committee to which I have made reference the one which Willard Bascomb was or still is the director?

Mr. PETERSON. I think he is their secretary or director, I don't know the exact title.

Representative COLE. I saw him some time ago and he handed me a paper he had prepared on the question of civil defense which I understand was circulated by him with your own people, along in December at least, in which he made this statement, among others. It was not a classified paper, and could have been published, disclosed without any restriction at all. He said:

The materials enveloped in and vaporized by the fire ball are mixed with bomb fragments, recondensed into highly radioactive particles, carried upward into the stratosphere and there released to be spread by the wind over an area of thousands of square miles. Where the fallout of these particles is concentrated their radiation may be lethal to unprotected persons in the open.

That seems to me to be a generalization of the hazard of fallout upon which civil defense people could have initiated appropriate action long before the February disclosure of the details of fallout.

Mr. PETERSON. Civil defense people were initiating and undertaking appropriate action starting last September.

Representative COLE. Wasn't that statement of Mr. Bascomb's I have just read sufficient for you to use for your purpose in discussing it with uncleared people?

Mr. PETERSON. No; I would not think so. I couldn't agree.

Representative PRICE. What is the date of that statement?

Representative COLE. December 1954. I don't need to be told the details of a danger of fallout when I am told that one weapon will expose people to the hazard of fallout if they live within a radius of thousands of miles of where the fallout occurs.

Mr. PETERSON. We have to be able in civil defense to measure and monitor the radioactive fallout, we have to be able to determine what is the proper order or instructions to give to people, we have to be able to determine the weather patterns at the time immediately preceding the fallout in order that we may direct people out of the fallout pattern.

As a matter of fact, in the western part of the United States it is possible we may be able to develop sharp enough procedures so that by evacuating our people into other areas from the fallout area we won't have a great problem about protective cover. There are many intricate features to this problem as there are in the Atomic Energy Commission's work.

Representative COLE. Those are things you should know and should be made known to the public eventually. My point is this generalization so early in the game should have been enough to alert your people and State and municipal authorities you deal with, that a real problem exists and that they should start steps toward at least making plans to meet that problem,

Mr. PETERSON. I would say my people were alert at the time we gained the information. Many of the city and State people were. But I should also say that you had a situation here which frequently develops in the Government where, until there is an authoritative statement, by the people who are in the best position to make that statement, you have conjecture on the part of people through magazines and newspapers and you have statements made by lecturers and you create a degree of public confusion in the country. Actually, there could be a serious discussion here as to whether in our attempts for various reasons—I don't question those reasons—to delay the issuance of information, we actually compound our difficulties rather than eliminate them

Representative COLE. I think you have a good point there. One moment to revert to this question of clearance of your people for access to restricted data.

Do I understand that the law is now such that that difficulty has been removed and you do not anticipate that it will be a problem in the future?

Mr. PETERSON. I don't believe I should say the law. I think I should say rather that with the announcement on February 15 the problem has been eliminated at the moment.

Representative COLE. I am talking about the inability of your people who are cleared for top secret information to discuss——

Mr. PETERSON. The distinction between top secret and Q clearance.

Representative COLE. That is right. Has that obstacle in your operations been removed so that it will be possible for you to have your people in such a status that they have access not only to top secret information but also restricted data?

Mr. PETERSON. The change made in September 1954 certainly is very helpful and I think would tend in that direction. We would still have the necessity, as I understand it, even though our people were cleared top secret, we would still have to secure a Q clearance.

Representative COLE. But that could be done simultaneously?

Mr. PETERSON. For new people, yes. If we had people on board who are top secret cleared we would still have to go through the process of getting Q clearance for them, which I believe in every instance would involve a period of some time.

Representative COLE. Not with respect to the old ones who are on board because they have already been investigated by the very same agency which they would now be investigated by in an application for restricted data. So it would be simply a perfunctory operation, I would think, to get your people who are now top secret cleared, also cleared for restricted data, a telephone call or letter would suffice.

Mr. PETERSON. I would assume your statement is absolutely correct, sir, and if that is the case the problem would be lessened materially.

Representative COLE. At any rate, if this continues to be a problem I think it is something that should be corrected and I hope that in your experience under the new law if you find it is not sufficient you will let the Congress know about it and I am hopeful they will take steps to correct it.

Mr. PETERSON. If I find that is the case I should like to have the privilege of coming to this subcommittee and presenting the matter.

Representative KILDAY. Mr. Hinshaw.

Representative HINSHAW. I think I will refrain from questioning at this time.

Representative KILDAY. Mr. Durham.

Representative DURHAM. Governor Peterson, the question here about the lack of Q clearance being a kind of stumbling block in carrying out the duties that you feel you should in regard to both security and treatment.

I can't see how that even if you had all of your people Q cleared—unless you could pass that information on to someone else who was Q cleared on down the line to even the local level—whether or not it is going to be effective. What good would it do you to have all your people Q cleared and then be unable to pass that information on to the Governors or the mayors or the citizens who have to perform this duty?

For instance, I am thinking of this: If a doctor in some small town didn't know the dosage of radiation and you couldn't tell him the dosage which was lethal—how would that doctor perform his functions if this radiation fallout covers the area.

Mr. PETERSON. You are quite right that for our people to be Q cleared has only this advantage: That we then can do the work, make the studies and come to the conclusions and make these plans.

Representative DURHAM. You hope those people will accept it at the local level and abide by what you can tell them?

Mr. PETERSON. That is true.

Representative DURHAM. But when you get down to treatment in the medical end of this thing you face an entirely different problem. They have to know, they haven't got to just believe, because you can't give a man a dose of morphine unless you know the number of grains between the lethal dose and one that will not harm him.

Mr. PETERSON. In connection with the illustration you use, I think our medical people do have quite a body of information with respect to radioactivity.

Representative DURHAM. That leads me to this question, and probably it should be directed to Dr. Bugher. I feel like we have enough information on this to be much further along than we are at the local level, because we have had this information since Hiroshima and Nagasaki and it is nothing new.

Radiation there was the same as the Marshall Islands except for volume.

We spent a lot of money in research which I hope is not bottled up. I think much of this information is bottled up at the present time but you do not have to go to the National Academy of Science to get it, we have it and should be looking for it, it should be made available in some way.

If it is necessary to protect the American citizen, Dr. Bugher, getting back to my question, do you feel today, in the position you are in, that you could release medical information enough to protect a patient in case he gets a dose of radiation that is dangerous or lethal?

I am talking about the civil-defense people.

Dr. BUGHER. Not only to the civil-defense people but all of the information pertaining to radiation injury to men and treatment of it, is available to the general public. All of this information is in the unclassified area.

Representative DURHAM. You are not only disseminating this to civil defense but you are disseminating it through other avenues of approach to the problem?

Dr. BUGHER. It is published in the normal channels of publication of all medical and scientific information in the medical journals over the country. I have checked our own situation and even the studies of the Marshall Islands people, which are not quite complete, although nearly so, are scheduled to be given at this next meeting of the American Medical Association and will be available as soon as the medical team, which is now in the Marshall Islands doing the checkup at 1 year of all these people, complete their manuscript with additional details, and will be then ready for publication in connection with that meeting.

Representative DURHAM. Your Department then is, I would say, not functioning entirely through the civil-defense agency, which is the responsible agency of the Government for the treatment and care of patients if an attack does happen, is that right?

Dr. BUGHER. It is our function to produce as much and as valuable information as we possibly can concerning all of these problems, not only for the information of the civil-defense agencies but for information of the entire profession.

Representative DURHAM. Have you any research on the treatment that is available to you at the present time on the absolute protection of the patient in case of an attack or in case of a fallout of radiation, that has been made available to the public or to the civil-defense agency?

Dr. BUGHER. With the exception of this one report which I mentioned which is in the process of completion for publication, there isn't any research work which has been brought to completion that has not been made available to the public.

Representative DURHAM. Then there is very little of the medical field in the treatment of radiation that is classified so it cannot be made available to the public?

Dr. BUGHER. No, sir. If you are referring to the radiation effects on human beings——

Representative DURHAM. I am referring to dosage, effect, and treatment.

Dr. BUGHER. There is not a single project that is classified that deals with the problem in the medical field of injury, treatment, or prevention.

Representative DURHAM. We do not have the problem in the field of medicine that we have in the field of telling the people when to get out of the way or evacuate because of the fact that in medicine they cannot measure the dosage of radiation inside the patient.

Dr. BUGHER. That is correct.

Representative DURHAM. I am glad to know that we have one field of this that is pretty well declassified for the public. Are you satisfied with the release of the medical aspect of this, Governor Peterson?

Mr. PETERSON. Yes, sir.

Dr. BUGHER. Mr. Durham, I wish to reemphasize if I may, that there simply is nothing classified in the medical side of this whole problem.

Representative DURHAM. We have classified this thing at the wrong end. The patient gets the dose before we get him. We can do a good job on him after he already has the dosage. That looks like where we are, according to Governor Peterson. That is a problem that I think we have realized before—that we have been in that predicament ever since this thing began.

I do not feel like we are making too much progress. Although we are cooperating in one way, in other ways there seems to be conflict.

Mr. PETERSON. May I make a——

Representative DURHAM. Because of the fact that the security laws of this country—and that is our own security giving us the trouble.

Mr. PETERSON. I don't think civil defense will work in the United States until and unless at every level of government, all Government agencies, the occupational segments of America, and citizens individually project their thinking, as they are going about their routine daily work to include the possibility of a nuclear attack and plan and act accordingly.

Now, otherwise civil defense would have to create here an agency that would duplicate everything in the Government and that would be a nonsensical approach.

Representative DURHAM. Everybody would have to be Q cleared.

Mr. PETERSON. That is right. For instance, in the Department of Agriculture, the personnel of the Bureau of Animal Industry, feeling that the Russians would probably in any protracted war introduce plant and animal diseases should be thinking as they are doing their ordinary research work with plant and animal diseases, about the possibility of such introduction and doing research work on the problem. And so on, I should say throughout the entire Government. I can say to you that the administration has taken this view. It takes time to get these things operating clear across the board.

Representative DURHAM. Do you not feel an approach to this thing without violation of security on weapons and things like that can possibly be worked out? Do you not feel there is an approach to this thing which will guarantee to the American public protection without violation of weapons production and size and all those things, that seems to be in the minds of some of our people?

Dr. BUGHER. Yes; I think that is true.

Representative DURHAM. Approach it sensibly, in other words.

Dr. BUGHER. I think so. I would like to add this further suggestion for the consideration of the committee. I don't think that the Atomic Energy Commission should restrict its activities in the field of atomic research—and in fact it does not—but I do not think it should restrict its activities to simply the development of weapons that can be utilized round the world for destruction, but rather I think it should utilize a great deal of its resources to help protect the American people. I know it is doing that in a measure and I would think there should be increasing emphasis in that direction.

Representative DURHAM. I think we have been aware of that, and in the beginning I think this committee was cognizant of what we faced, and we have watched all of the research projects asked for—medical and other approaches to this problem—but we find ourselves wound up here in our own security setup which we cannot seem to get out of without violation that is important to the enemy.

Then, too, we try to keep books, try to departmentalize everything when we keep books. When this bomb comes, the bomb isn't going to seek out any individual cash registers or special accounts, either in the Government of the United States or in the hands of the private individuals.

Representative KILDAY. I believe Admiral Strauss indicated he wanted to be heard.

Mr. STRAUSS. I want to call particular attention to a response that Dr. Bugher made to Congressman Durham by reason of its importance in a current matter.

A statement has been made and has received a good deal of circulation to the effect that the Commission was withholding as classified information medical information having to do with the treatment of radiation injuries. Dr. Bugher, I think with due regard for the ethics of his profession, has answered that obliquely by saying we were not classifying any such information.

I would like to make it very much more emphatic to scotch that story as an irresponsible statement.

Representative KILDAY. Maybe I will take the responsibility of asking whether you referred to testimony of Dr. Leroy before the Senate committee.

Mr. STRAUSS. I don't recall who made the statement, but I have seen it and heard it repeated.

With your permission I would also like to pay a compliment to my predecessors in the Commission because I have been handed a moment ago, a document which I had not previously seen. It bears the date of January 1953, which antedates my return to the Commission, and must have been in the course of preparation some months. It is on the subject of public safety in connection with weapons tests. It states:

> Radioactive particles in the cloud following a detonation may fall back to earth virtually anywhere.

It says [reading]:

> Fallout, the name given to the descent back to earth of the radioactive particles in the cloud following an explosion—

et cetera.

Then the following paragraph headings are listed and are themselves indications of what this document contains:

"Effects of weapons tests," "possible hazards from fallout." "Characteristics of a nuclear detonation," "formation of the cloud." "Meterological studies," "radiation effects," "settling of dust particles," "radiation measurement."

I haven't read these paragraphs but they obviously contain a good deal of pertinent information.

This is a public document obtainable from the United States Government Printing Office. I think it is indicative of the fact that, as was stated some time ago, the public doesn't like to hear bad news. This has been extant for 2 years and some months.

Representative KILDAY. Mr. Holifield?

Representative HOLIFIELD. Mr. Chairman, I would like to say that there has been a great deal of general information pointed to by the chairman just now. I think I am in the same position Governor Peterson has taken, that that type of general information is not adequate for the Governor to take to the mayors and the governors and convince them of the necessity for a civil defense program.

I believe that the information contained in Admiral Strauss' statement as of February 15 this year more approaches a usable type of information than Mr. Dean's treatise on the general nature of fallout and nuclear explosions.

So I think the usable information as far as the public is concerned dates from about February 15 of this year rather than prior, although some knowledgeable person might be able to compute possible danger, yet there was a lack of authoritative information up until that time. I am very happy that statement wasn't made at that time.

I have some questions, Mr. Chairman. They are not directly on the subject of security between these two agencies. If time permits, I would like to ask a few of them. I think they are important.

Representative KILDAY. Go right ahead.

Representative HOLIFIELD. I believe there is something like 70 critical defense complexes in the United States consisting in some instances of counties, cities, and parts of States; is that not true, Governor Peterson?

Mr. PETERSON. Yes, 70 critical metropolitan complexes, 92 cities.

Representative HOLIFIELD. Do you believe it is possible to have an effective civilian defense in those areas unless we take into consideration the problem of the complete target area?

Mr. PETERSON. No. The answer to that question would have to be no. The question becomes: How do we go about gaining our objective?

Representative HOLIFIELD. I am not getting into that at this moment. I realize that your present civil-defense law as passed in 1951 put certain restrictions on you to deal with cities, counties, and States, other local political subdivisions, in order to obtain an effective civilian-defense plan within a critical target area. I realize that law exists and I certainly have no criticism of anything that you have done in the way of contacting the people within those areas and trying to get them to become aware of the need for a real civilian defense plan in those areas.

Do you believe that each of these target areas will need to have a civil-defense plan tailored to fit the peculiar topography, transportation, natural barriers such as rivers, mountains and outlets and inlets into the outer areas around these target areas?

Mr. PETERSON. Yes, and let me say this: take a complex such as the New York-New Jersey complex, it involves at least 3 States or parts of 3 States. The Philadelphia-Delaware complex involves 3 States, I believe it is 11 counties and 26 municipalities.

Now, there are at least 3 or 4 different ways that you can approach a cooperative effort within any such complex.

Representative HOLIFIELD. May I ask you this before we get into that. May I ask you if it is not necessary to have the cooperation of almost all of those political subdivisions if you do have an effective target area plan?

Mr. PETERSON. Yes, sir.

Representative HOLIFIELD. And the only way you can get that cooperation at the present time is on a voluntary basis?

Mr. PETERSON. It is a little bit more than that. You can get it on a voluntary basis without respect to the law, or you can get a good deal of it by interstate compacts plus the voluntary element.

Representative HOLIFIELD. Your interstate compacts would of necessity be also voluntary. There is no compulsion to get them into those compacts.

Mr. PETERSON. No, but once they enter the compact, as many States have, and it is ratified by the Congress, it becomes law.

Representative HOLIFIELD. But the initiative must be voluntary and the initial entrance into the compact must be voluntary, and if any local areas refuse to go in initially, there is no way at the present time under law to compel them to go in there, is there?

Mr. PETERSON. No, sir.

Representative HOLIFIELD. Do you believe that within any target area in America—I am speaking now of the 70 target areas, that you can obtain complete cooperation and complete financing on the basis of voluntary local participation and on the basis of volunteer local financing?

Mr. PETERSON. I am certain that you recognize, Congressman, you have asked a pretty big question.

Representative HOLIFIELD. Have you been able—I will put it in the past tense—Have you been able to get that type of a civilian-

defense plan for any target area in the United States based on volunteer participation and volunteer financing?

Mr. PETERSON. What I meant by a big question was partly the utilization of such words as "complete." It is hard to get complete planning either in or outside of a law. I would say that in some of these complexes a reasonably good job has been done, but I don't know of any job that has been done anywhere that you could call complete or satisfactory.

Representative HOLIFIELD. How many people are employed in your organization?

Mr. PETERSON. At the present time I would say approximately 750 people.

Representative HOLIFIELD. Do you know how many people are employed on the local political subdivision basis?

Mr. PETERSON. I do not know at the moment, no, sir.

Representative HOLIFIELD. Is there anyone in the room who does know?

Mr. PETERSON. I don't think so. That information is hard to get.

Representative HOLIFIELD. I realize that. Do you believe that it is possible to have an adequate civilian-defense plan in these 70 critical target areas on a volunteer basis, realizing that the law now requires you to have it on that basis—and I am asking this question because I believe that legislation is needed to help to protect the people of America, and I will be very frank that I do not believe that you can get it. I am not prejudging, but that is the reason I am asking the question.

Mr. PETERSON. I think our opinion with respect to prejudging could logically be different with respect to this very complex question. I will have to take several words to answer that question.

I would say because of the nature of an atomic attack, the attack being made on people where they live, in their homes and residences, that there must always be a very high degree or percentage of participation in civil defense activities at the local level and on a voluntary basis because, in the final analysis, whether you and I live will depend upon what you and I do. This country will never be able to uniform enough people or hire enough people to meet civil defense needs of the United States.

However, it could well be that in a middle ground somewhere a paid personnel, or personnel made available possibly through the military in some manner, could be utilized for certain purposes as cadres or as skeletal organizations.

Now, we do accomplish that somewhat through the State national guards and the possibility of the creation of a State militia, for which there are bills now before the Congress. We accomplished something along the direction you are suggesting. Some people have suggested to me that boys who do not meet the qualifications of the military for the draft should be assigned to civil defense.

I would be perfectly agreeable to that except I don't care to have misfits, mental misfits, or moral derelicts that the Army can't handle. I wouldn't want them in my outfit either.

Representative HOLIFIELD. We don't want to do damage to a great mass of American people who might not be able to possibly, like you and I, pass a combat military examination, but still might

be able to perform duties of citizenship which do not require such rigorous physical conditions.

So let's not classify all these boys that have been turned down maybe because they had 1 eye bad, or maybe because they had 1 foot flat, as being physical misfits to the point they couldn't function in civil defense. If you do, you will lose a lot of your volunteer people.

Mr. PETERSON. My language will show I made no such classification, and I join you in that.

Representative HOLIFIELD. If we are going to depend upon volunteers, we might also be in the position of depending upon a boy who had one flat foot who couldn't get into the Army, to do something in the civilian defense field, couldn't we?

Mr. PETERSON. Absolutely.

Representative HOLIFIELD. You wouldn't object to him helping you?

Mr. PETERSON. Not at all, and I did not so indicate. The record will show it is clear.

Representative HOLIFIELD. You would not object to some of these reserve military people who still have an obligation to serve their country as Reserve officers and Reserve enlisted men—I have four in my family in that position—you wouldn't object to them having certain civilian defense duties under proper assignment, would you?

Mr. PETERSON. No, sir, and I have so urged.

Representative HOLIFIELD. I am glad to hear you say that. I am glad our minds are running in the same channel.

Mr. PETERSON. I think there may be a middle ground where there could be some change in the present organization and procedures.

I am not prepared today to say exactly what that would be. I have discussed this matter with people all over the United States and certainly I keep an open mind about it. It may be that time will show that some changes in the law may be necessary. I am not, as I say, prepared to make such suggestions today.

Representative Holifield. You have no idea of what it would cost to have an adequate civilian defense program, do you, in these 70 critical target areas?

Mr. PETERSON. No, I do not, sir.

Representative HOLIFIELD. You can't do it with $12 million or $62 million, can you?

Mr. PETERSON. No. The $12 million that we are asking for now is purely for plans, surveys, and research.

Representative HOLIFIELD. I realize that.

Mr. PETERSON. It is adequate for that. I want to point out that the philosophy I laid down a little while ago would indicate that in every level of Government we use to the full the existing governmental agencies in the civil-defense effort, and we are doing that now, beginning to do that in the National Government.

For instance, Mrs. Hobby in the Health, Education, and Welfare last year secured from the Congress a million dollar appropriation to take over certain responsibility we had delegated to her in the field of health, education, and welfare.

This year she asked for a million, six. The Appropriations Committee suggested we were not going at it properly. We have been on both sides of this argument before. They suggested we come in with

a unified package and submit it as a whole. That is an orderly way to do it, and I suspect we will do it.

I take the time to point out that what I say about the Federal Government applies equally, I think, at State and city levels, so that really in the civil-defense area there should be a great deal more effort and personnel and equipment than appears simply with the label civil defense.

We must use the total resources of the United States to meet this total threat to the United States.

Representative HOLIFIELD. I agree with you 100 percent and realize it hasn't been done, and I am not blaming anyone, because I think it is a problem that has been growing since 1945, since the first atomic bomb, and it has grown to be bigger than the attempt of any administration, either prior administration or this administration, to meet it.

I am earnestly seeking ways, and I would say this much: That frequently if your appropriation for civil defense has been turned down by the Congress because of a lack of confidence in its effectiveness, I would say a word of encouragement to you, not to be afraid to state the problem as it exists and place the responsibility upon the Congress of the United States to do the job, to come up with the necessary funds to do the job that is necessary for the continuity of civilian function, both from the standpoint of civilians and from the standpoint of supplying logistics of war to our defense people in case of combat.

That is all.

Representative KILDAY. Mr. Price?

Representative PRICE. Mr. Chairman, I might ask this one question. Mr. Peterson, what do you think of the proposals that have been made in 1 or 2 committees that a national registration of people of all age groups be made for a civil defense manpower pool?

Mr. PETERSON. Well, the mere act of registration would not be too meaningful. Civil defense in its early days fell into the error of going out and getting people to sign up for civil defense without having specific assignments for them.

It has been my impression that the worst thing you can do is get people to join up and not have a meaningful job for them to do.

It may be, of course—I am not familiar with this proposal—if the proposal contemplated a followup, which I assume it would——

Representative PRICE. I assume so.

Mr. PETERSON. Then, depending upon the proposal, it might be very advisable. I don't know.

Representative HOLIFIELD. Mr. Chairman, there is one more point I wish to bring up, that a great deal of apathy and indifference exists. I find this is true in my district when I question people there. There is a lack of direction, of a centralized direction of what looks to them to be a practical program.

I would say this: that if a practical program can be evolved, I think that it might well be very effective if the President went on the air and on television and talked directly to the American people, because with all due respect to the Members of the House and the Senate and yourself, sir, and Admiral Strauss, I don't believe that this program will be accepted by the American people unless a program is given to them from no less authoritative source than the President of the United States.

Mr. PETERSON. I would like to make one comment with respect to practical programs. My predecessor, a distinguished Member of

this body for 10 years, who served as the Governor of Florida for two terms, and is a very wise and capable and respected citizen of the State, did lay the foundations in various fields of civil defense. I think it should be clearly understood by the members of this committee that in what I call the postattack phase of civil defense we have patterned our civil defense development on the British experience, which is the best in the world, and have modified it by consultations with the Germans, and that in every State and city in the United States there is in being those fundamental traditional services of civil defense. They are relatively well equipped, they vary in their degree of proficiency from place to place because they are volunteers, they are not paid, but there is in being this very important element of civil defense. Those services are the auxiliary fire departments, auxiliary police forces, transportation, communication, rescue services, mass welfare feeding and sheltering, and the warden service.

They do exist, and people who say that there is no civil defense in the United States overlook this very important development that Governor Caldwell set up in this country and which we have implemented since I have been here.

I am more interested in the preattack phase. I won't take much of your time, though the subject would be worthy of it. In the preattack phase we are trying to save the lives of the American people. In the postattack phase you are cleaning up the mess after it happens.

In civil defense you have two tools. One is space and the other is shelter, and the combination of those two is all there is to civil defense.

Since I saw Operation Ivy which occurred in Eniwetok in November 1952, and which blew a hole, you will recall, in the earth 175 feet deep, big enough for 14 Pentagon Buildings, I have been preaching over the length and breadth of this country that we must utilize space by evacuating our cities, getting out of them, because to stay in them is to die—and I don't believe anybody on this committee would contest that statement.

We are trying to utilize space. When they get the detection system completed that is now being built, we will hope to have 4 to 6 hours to utilize that space and evacuate these cities. We must also use a balanced shelter program, not alone against radioactivity, but against the effects of blast.

There have been practical programs developed, scores of bulletins and pamphlets and treatises in this field that will stand inspection and have never been criticized, to the best of my knowledge, by any competent individuals in this entire area of civil defense.

Now, I would grant, Congressman Holifield, that not enough has been done, that we are not ready to meet an atomic attack, that we need to step up our program—I hope we can—but in fairness to the thousands of American people who have donated time and effort and their mental abilities without any compensation at all, I think I should call attention to the fact that there is this foundation of civil defense in America.

Representative HOLIFIELD. I think you should call attention to the foundation, but that you should not build an edifice on it and hoodwink the American people. You know as well as I do that you couldn't evacuate the city of Washington in 6 hours, much less 1 or 2 hours, because we haven't got the bridges or the roads to get them out.

I doubt it we could evacuate the city. I have tried to get to work with the 14th Street Bridge clogged with traffic, and it takes an hour

to get from the Pentagon across the bridge when there has been an accident on the bridge.

Mr. PETERSON. All the evidence we have in America, which now includes 10 or 15 practical tests, and the 1 careful study made of a big metropolitan area, Milwaukee, 1,010,000 people, indicates evacuation will work. However, it is true, there will have to be some bridges widened and roads built.

Representative HOLIFIELD. Why don't you come forward with a practical plan and say that we need temporary bridges across the Potomac, we need temporary bridges across other rivers that can be thrown up if the normal bridges are knocked out? Why not come forward, regardless of the budget and financial request, and say what is needed for one of these target areas, so that we can at least shift the responsibility onto the people and let them know what is necessary, and then if they don't do it, you and I have discharged our responsibilities.

Mr. PETERSON. We will do that. We have done it in the only study in the history of the world that has been done; we did it in Milwaukee, Wis. We are now asking the Congress for funds to do it in 92 target cities, plus some cities that are closely located to military targets and therefore will become targets themselves.

Representative HOLIFIELD. I want to support you to my utmost.

Mr. PETERSON. Thank you.

Representative COLE. I have a couple of points to discuss with Governor Peterson. A while ago you urged that the Commission not concentrate all its efforts on making weapons of destruction, but to devote some if its thought and energy and funds to other purposes, including civil defense.

That prompts me to inquire as to what you feel the Commission should be doing in the atomic energy field with respect to civil defense, that would be helpful to you, which the Commission is not now doing.

Mr. PETERSON. I would not want to answer that question except very generally without an opportunity to consult with the members of my staff.

Representative COLE. I just don't want the impression to go out through the press that when you made the statement that you felt the Commission ought to be doing something that would be helpful to civil defense, it meant that the Commission was derelict in its responsibilities to being helpful to you.

Mr. PETERSON. I don't want that impression to go out, and I think I qualified my language, or I tried to.

Representative COLE. You said they were doing something, but inferred you wanted them to do more.

Mr. PETERSON. I try to qualify everything I say because it seems to be the course of wisdom as you go through this world, but the point I was trying to make, Congressman Cole, was a generality. I was not trying to be specific, and I certainly was not trying to be critical.

I would only suggest that I think both the Department of Defense and the Atomic Energy Commission, all of us, in fact, have a responsibility to the American people to utilize our resources not with just one eye on what the lawbook says we are supposed to do, but with an eye on the welfare of the American people.

And so I think that since we have spent tremendous sums of money to test the effects of atomic explosions on military instruments, air-

planes, tanks, and all that sort of thing, we have spent until this year only the sum of $60,000 of American taxpayers' money to make similar tests on civilian instruments, houses and things of that nature. This year my agency is spending in a test that the Atomic Energy Commission is helping us with the sum of $650,000 for research of this type. American industry is giving us, believe it or not, about $110,000 in cash and a million dollars in equivalents.

Representative COLE. When you say you spend $60,000 testing housing structures that might be affected by atomic blast, you certainly are not including the vast thousands of dollars the Commission spent on that same subject; are you?

Mr. PETERSON. I would hesitate to differ with the distinguished gentleman from New York, who spent a good deal of time in this field, but the Commission studies have not been primarily in the field of the effects of atomic blast upon civilian-type installations. I think you will find they have been primarily on the effects of military-type installations.

Representative COLE. I have seen many of the aspects of the tests which cost thousands of dollars to construct and create, which I was told were part of the lessons to be learned in connection with civilian defense.

Mr. PETERSON. I think this is true, Congressman Cole, because both of us want to be utterly fair with what we say since we are dealing with the welfare of our people we do extrapolate a good deal of information from the tests run by the Atomic Energy Commission and the Department of Defense for more exclusively their purposes, but which do have application in our fields. That is very valuable to us.

Representative COLE. I didn't want the thought to be left that only $60,000 had been spent by our Government to find out what effect atomic blast has on homes of American people. That would be misleading.

Representative PRICE. Mr. Peterson, how much have you set up in the 1956 budget to implement these tests that you people are interested in?

Mr. PETERSON. We made another request, of course, for research funds. I am sorry, I don't have the figures in mind. I have appeared before the House Appropriations Committee. We are asking in the special appropriation, the supplemental 1955, that I go before the Senate tomorrow on, for $2 million more in research. But the amount of money we have had for research has been quite meager, sir.

Representative PRICE. Due to the failure to ask for it, or has it been restricted in how much you can request?

Mr. PETERSON. I would say it has been difficult to convince the Appropriations Committee of the necessity for it. It seems that money for military research or atomic energy research is somewhat more glamorous than for civil defense.

Representative PRICE. Has the Appropriations Committee reduced your budget or have you been reduced at budget level before you got to the appropriations level?

Mr. PETERSON. The Appropriations Committee has uniformly reduced the budget until the last 2 years when they made slight increases, I am happy to say, in our appropriations, contrary to the

general trend in the Government. We have been rather fortunate in that respect.

Representative PRICE. What happened at the budget level on it? Have they reduced your requirements?

Mr. PETERSON. I think it would only be fair to say there have been some slices; yes, sir.

Representative COLE. On that question of appropriating public funds for civil defense, I am curious to know the reason why more funds have not been appropriated. Certainly the Congress is responsive to public opinion.

If public opinion felt more funds could be spent and should be spent effectively for civil defense, the Congress would be the first to do it. I don't believe the American public would hesitate to spend our last dollar if they thought that dollar could be spent reasonably well to protect American homes and American lives.

Why is it that the public opinion in this country is, as has been characterized, apathetic? Is it because they don't know the extent of the hazards that they are exposed to or because they do know the hazards they are exposed to and they perhaps have the attitude of fatalism that there is no reasonably adequate defense to that hazard? Which is it?

Mr. PETERSON. I think it is some of each or both, and I think that the best statement that has been made by any responsible political leader in the world was the one made the other day by Sir Winston Churchill. I would like to add this further, Mr. Cole.

The implications of the atomic age are extremely difficult for any of us to comprehend, and what will happen in the event of a nuclear war is a difficult thing for the human mind to grasp. The problem is so big and so new that it just nearly staggers the imagination. I have lived with this thing for 2 years now. I think I have thought of every facet of it. I have discussed it with all scientists I could get hold of, all military people, people in the political life, common citizens in America, and have troubled with it a good deal myself, and I don't assume that I understand all of it.

We are dealing here with something that is just tremendous and, in fact, I believe that as of today we can still do effective things through civil defense, but if we come into the age of the intercontinental ballistic missile, going thousands of miles an hour, carrying nuclear warheads, and atomic warheads, there will be no hope for mankind that I know of except to dig into the ground and to spread himself out over the surface of the earth.

The fact is, we have just developed in this world of ours instruments of such terrible destruction, so horrid in character, so miserable—thank God we have them rather than the enemy having them exclusively—instead of having a bear by the tail, we have a Frankenstein—or rather a Frankenstein has us by the neck. The question is whether we are going to have enough commonsense to live in peace. If we don't, we are going to suffer a tremendous catastrophe. I don't think it will be the end of the world myself yet, but we are certainly going to mess up the countryside.

Representative COLE. You are quite right, but I am inclined to the viewpoint that the American public is roused to the terrific danger involved in nuclear weapons, guided missiles, and all the

horror you portrayed, and that they have a feeling of futility, that there just isn't enough money in the whole country to give all of our people the reasonable protection which all feel they should have.

That doesn't mean for a moment that efforts for civil defense should be belittled, discontinued, disparaged in any degree, but I don't think the mere expenditure of money is going to necessarily give the people the protection they feel they should have.

Mr. PETERSON. I don't think so, either. I think it is more fundamental than money, but money will have to be utilized. There are many reasons people don't respond. You have mentioned some of them. There is the fatalistic attitude, lack of comprehension on the part of some, there is the fact that some believe that the military can prevent this thing from occurring. That is the easy way. I wish I could believe that. I wish the enemy couldn't touch us because somebody else does the job for me.

There is the indifference that just comes because we are all busy trying to make a living and raising our families. There are 5 or 6 things somewhat similar in nature that cause us to set these things aside. Then I think this is very true, too, that the sheer horror of a nuclear war causes some people to set up a mental block in their minds. They say that this is so bad we had just better think it out of existence, and they wish to have peace and wish so hard that they think this horrible thing cannot happen in the United States.

We are really now getting into the guts of this thing, if I may say so. We are getting down to the really tough thing here. It is a lot tougher to mold the people in the proper direction for their own safety and to work with their mental attitudes and to exercise leadership that is necessary than it is to build bombs or than it is to build guns or to build airplanes. It is much more difficult.

Representative KILDAY. In summary, I would say, Governor, that as of now your relationships and receipt of information from the Commission is adequate, that there is no information that the public should have, now in existence, that has not been transmitted to you and to the Admiral, and there is no suggestion at this time as to any amendment desirable in this security portion of the Atomic Energy Act, other than the suggestion that consideration be given to the persons cleared for top secret to have access to atomic energy information. Is that correct?

Mr. PETERSON. You are correct, sir. Our relationships are fine and on a personal basis they are exceedingly pleasant.

Mr. STRAUSS. Thank you.

Representative KILDAY. I want to thank all of you gentlemen for coming here today. On either Monday or Tuesday of next week we will hear from a representative of the Attorney General. Notice will be given of the time and place of that meeting.

(Whereupon, at 5:10 p. m., Thursday, March 24, 1955, the committee was adjourned, subject to the call of the Chair.)

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